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Improving the transition of a successful tender from Estimating to Project Management phases

A dissertation submitted by

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Abstract:

Research indicates that in Australia, there is a gap in the knowledge regarding a specific set of processes which should be employed by construction companies for the gathering and transfer of tacit project knowledge between estimating and project management teams at tender handover. It has been identified by the project sponsor, that the current processes in place for the capturing, codification, and transfer of project knowledge from estimating to project management teams are out of date and do not reflect the current practices of the estimating or construction teams. They have identified this as an area of interest for the implementation of process updates and improvements.

This project aimed to identify and design process improvements that would enable the effective and efficient management of knowledge, and it transfer between estimating and project management teams.

To understand the relevant literature pertaining to the topic, an extensive literature review was undertaken. It identified that that there are proprietary software systems available to assist in the management of project information. However, there are limitations to their application specifically for the capture or management of tacit knowledge. It identified that effective knowledge management is critical to the success or failure of construction projects. Value stream mapping was identified as an appropriate lean construction tools to form the basis of the project methodology in order to improve the transition of a successful tender from estimating to project management phases.

The five phases of value stream mapping are the initial analysis, mapping the current state, mapping the future state, developing the action plan, and testing. Once the inefficiencies were identified within the existing system, potential improvements were identified. A revised tender management procedure and flowchart were designed, which worked in conjunction with the integrated workflow solution (IWS). The proposed IWS was formatted as an excel spreadsheet (named the Tender Knowledge Register or TKR), with different tabs representing each phase in the tender process, with prompts to assist the estimating team in identifying and codifying reusable project knowledge. All captured knowledge was electronically filed, in addition to the tender documentation, with a guideline provided for the transfer of all knowledge and information to the project management teams, upon successful conversion of a tender to a project.

The proposed solution was evaluated through an analysis of quantitative survey results from the key project stakeholders to determine the system's relevance both to the project sponsor and the wider construction industry. Results were measured against the key performance indicators of increased efficiency and effectiveness (quality of information). The results were generally positive.

The estimating team considered the revised processes to be more relevant to their current practises than the existing processes. This is evident in the increased overall relevance rating from 31.1% to 71.1%. The time required to complete the processes was similar, with the existing process taking an estimated 13 hours, and the revised taking an estimated 13.77 hours. The increase in estimated time did not dramatically affect the estimating team's overall ratings of the system. The average rating was 5.94/10.

The project teams rated the system higher overall than the estimating team, with an average rating of 6.47/10. It is proposed that the higher rating provided by the project teams is due to the system being tailored to suit their knowledge and information requirements at project start-up. The project teams considered the information which has been included in the tender knowledge register (TKR) as very important. The overall average importance rating of captured information and knowledge, and its presentation within the TKR was 7.8/10.

The scope of the project was limited to the knowledge and information transfer between estimating and project management teams. It was determined that focusing on more than stage of the project lifecycle would exceed the scope and intent of this undergraduate research project.

It was noted that the response rates to surveys was poor. The lower-than-expected response rates to surveys resulted in a higher margin of error (ranging from 13.56% to 22.89% @ 95% confidence) relating to the accuracy of responses.

It is recommended that the proposed systems undergo further testing by real-time application to tenders. This will aid in the measurement of the effectiveness, efficiency, and quality of the information and knowledge transfer. Further testing of the process (potentially with compulsory participation from stakeholders), combined with minor refinements, has the potential to produce a powerful knowledge management system that can be implement to continuously improve knowledge transfer between estimating and project management teams.

The system would fulfil the requirements of both the sponsor, and with minor adjustments, other organisations in the industry.

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Chapter 1 – Introduction:

This chapter provides an overview of the research project, including the background of the topic and the identification of a need for further research. It clearly defines and discusses the project objectives, scope, and limitations.

The project provides a comprehensive review of relevant literature relating to the project, as well as a methodology detailing the processes involved in undertaking the literature review and subsequent design and testing of proposed improvements to the existing processes surrounding the transition of information and knowledge between relevant teams. A review is undertaken in order to establish the perceived effectiveness and applicability of the proposed processes both within the sponsor's organisation and the wider construction industry. The report includes a discussion of results, further changes required, and recommendations for the project sponsor, and works that may be undertaken in the future.

1.1 – Project Background

The project is industry-sponsored by FK Gardner and Sons Pty Ltd (referred to as "the sponsor"), a second tier commercial Toowoomba-based construction company with current projects in Queensland, New South Wales, the Northern Territory in Australia, as well as works in Papua New Guinea. It has been identified by the sponsor that the current processes in place for the capturing, codification, and transfer of project knowledge from estimating to project management teams are not being followed by a majority of team members. This has been determined through the results of internal quality assurance audits, which are undertaken on a selection of projects each year, according to Scott Carter, Group Manager IT and Systems (Carter S, 2016, pers.comm Feb 2016). The sponsor has identified this as an area of focus for improvement.

1.2 – Project Aims

The overall aim of the project is to identify and design process improvements that will enable the effective and efficient knowledge management transfer for estimating and project management teams. They will enable the codification of both tacit and explicit project knowledge captured by the estimating team over the duration of the tender period, and during post-tender negotiation. They will facilitate the transfer of this knowledge to the project management team. With these aims in mind, the following objectives have been identified:

- Understand relevant literature for knowledge capture, management, and transfer, lean construction theory, and value stream mapping for process re-engineering.
- Determine the current usage, perceived need of, and suggested improvements to the existing procedures in place at the sponsor's organisation, by both estimating and project management teams.
- Design process improvements that can be implemented into the existing quality assurance system, which will assist in effectively gathering, codifying, and transferring project knowledge between key stakeholders.
- To compare the proposed process improvements with the outputs typically delivered using the existing systems and processes, by way of a review from key project stakeholders from estimating and project management teams.

1.3 – Objectives

In order to achieve the project aims it is necessary to undertake the project scope as follows:

1.3.1 Understand relevant literature for knowledge capture, management, and transfer, lean construction theory, and value stream mapping for process re-engineering:

A literature review will be undertaken, focusing on the following areas:

- What is Knowledge Management?
- Knowledge Management Dimensions
- Knowledge Management Classifications
- Knowledge Management Models
- Capturing and Reuse of Project Knowledge
    - Current practise
    - Shortcomings of current practises
- Knowledge Capture and Re-Use Strategy
- Knowledge Transfer and Knowledge Management
- Communication in Knowledge Management systems
- Handover between Estimating and Project Management Teams
- Proprietary Document Control and Management Systems
- Implementing Change in Construction Companies
- Lean Construction Theory
- Value Stream Mapping as a Lean Construction Tool

1.3.2 Determine the current usage and perceived need of, and suggested improvements to the existing procedures in place at the sponsor's organisation, by both estimating and project management teams:

- Undertake a review of the existing processes, using key stakeholder opinion surveys to determine the effectiveness and efficiency of the existing processes.
- Determine what information and project knowledge is perceived by the estimating team as necessary to transfer to the project teams at tender handover.
- Determine what information and project knowledge is required by the project management teams when they commence work on a new project.

1.3.3 Design process improvements that can be implemented into the existing quality assurance system, which will assist in effectively gathering, codifying, and transferring project knowledge between key stakeholders:

- Determine what information and project knowledge is typically missed in the transfer between estimating and project management teams.
- Determine existing systems which must be removed or redesigned to encapsulate the required knowledge
- Implement value stream mapping as a lean management tool to re-engineer the processes pertaining to the capture and management of project knowledge and information, and its transfer to the project teams.

1.3.4 To compare the proposed process improvements with the outputs typically delivered using the existing systems and processes, by way of a review from key project stakeholders from estimating and project management teams:

- Undertake surveys with key stakeholders to determine the perceived improvements to the redesigned processes.
- Analyse the results of the surveys to establish the systems perceived effectiveness
- Make research-backed recommendations to the project sponsor regarding the implementation of the proposed processes.

1.4 Project Scope and Limitations

The scope of the project is limited to the knowledge and information transfer between estimating and project management teams. It is acknowledged that applying lean management techniques such as value stream mapping to only one transition within project lifecycle does eliminate other potential process improvements. However, it was determined that focusing on more than one aspect of the sponsor's systems in regards to knowledge and information management would exceed the scope and intent of this undergraduate research project.

Additionally, it has been identified that any proposed process changes must be tested in real-time on projects from tender through to project start-up, including handover in order to achieve 100% confidence in efficiency or quality improvements. Due to time constraints a case study cannot be completed in real time, therefore detailed stakeholder surveys will be used to evaluate the proposed process changes, which if deemed to be an improvement may be further tested and implemented by the project sponsor at their discretion.

Chapter 2 – Literature Review:

2.1 – Introduction to the Literature

In order to design and implement a customised a solution for the effective information and project knowledge management and transfer between estimating and project management teams, it is necessary to undertake an extensive literature review on the subject matter. This review includes, but is not limited to; a review of the appropriate literature defining knowledge and information transfer and management; industry standards relating to knowledge transfer and information management; effective communication strategies; implementing change in construction companies; the effective use of lean construction theory and value stream mapping in process re-engineering; and proprietary document management systems. This review has considered peer reviewed journal articles which have been the main type of criteria searched for authenticity on the topics of construction information management and transfer.

2.2 – What is Knowledge Management?

The nature of the construction industry in Australia is such that client's demands must be met as quickly as possible, with the lowest cost possible. If one or both of these criteria aren't met, clients will be lost to the competition. This results in huge pressure being placed on individuals, at a time when and more and more decisions are being made through means of electronic communication. (Anumba et al. 2008). Successful construction and project managers are those which can combine their own and their team's past experiences with the latest technologies and processes, to innovate faster than their competition. Effective knowledge management (KM) offers real potential to individuals and organisations seeking to further increase their productivity and profit.

Collective staff knowledge is one of the greatest assets that a construction company holds, and managing and distributing that knowledge internally is a key factor in obtaining and maintaining competition. Therefore, Demarest defines knowledge management as; "the systematic underpinning, observatism, measurement and optimization of the company's knowledge economies". (Demarest 1997, p. 374).

The Harvard Business Review's definition for knowledge management is "the way companies generate, communicate and leverage their intellectual assets" (Cited in Anumba et al. 2008, p. 50). This definition can be broken down to highlight that which is vital to the delivery of successful KM in construction companies:

- "The Way" implies that there is no right, wrong, or fixed way to approach KM, but that each company must customise a solution to fit their needs.
- "Generate" implies the need to recruit the best staff, and consistently train them to maximise their knowledge and abilities.
- "Communicate" reinforces that communication between parties/groups/teams is vital
- "Leverage" reinforces the need to use the information and/or knowledge that is being transferred. Capturing and communicating information has little use unless it is applied at a project level.
- "Intellectual Assets" implies that knowledge captured is an asset which, if applied effectively, can assist in gaining a competitive advantage.

Forcada et al. generally aligns with this definition, defining knowledge management as "the identification, optimization, and active management of intellectual assets to create value, increase productivity and gain and sustain competitive advantage". (Forcada et al. 2013, pp. 83-91). Forcada et.al also discusses the difficulties in applying KM in construction firms, as projects rely heavily on knowledge inputs from several members of a project team. Adding further complication is that construction is a transient industry with high rates of employee migration between companies. (Forcada et al. 2013, pp. 83-91).

Several studies have examined the acceptance and understanding of knowledge management in the construction industry globally (predominantly in the United States, UK and Asia), however it can be assumed that the Australian construction industry is not dissimilar. A summary of the aims and findings of several of these studies in Table 2.1 (below):

Table 2.1: Summary of previous studies into knowledge management within the construction industry (Forcada et al. 2013, p. 84)

AUTHOR	FOCUS GROUPS	AIM OF THE ANALYSIS	FINDINGS	COUNTRY
Carrillo and Chinowsky	Design and construction firms	KM strategies	Clear distinction between design and construction firms.	USA and UK
Carrillo et al.	Construction industry	The use of KM	The majority of the companies actively used KM practices.	UK
Chen and Mohamed	Construction organisations	Map KM activities	Tacit KM is very important in construction companies.	Hong Kong
Drejer and Vinding	Construction industry	KM importance at the firm level	Knowledge-anchoring mechanisms and partnering may help reduce the shortcomings of project-based organisations.	Denmark

Esmi and Ennals	Construction companies	Implementation of KM strategies	KM is considered a fundamental organisational asset even though few companies are currently implementing strategies comprehensively or consistently	UK
Fong and Kwok	Contracting firms	Organisational culture and KM success	Cultivating the right organisational culture is a prerequisite for successful KM implementation in contracting organisations.	Hong Kong
Issa and Haddad	Construction companies	Implications of organisational culture and IT on KM	Not all types of knowledge can be shared using ITs. A proper organisational culture, mutual trust between employees and organisation, and the use of computer-supported collaborative work leads to more knowledge sharing.	
Zerjav et al.	Engineering and construction organisations	Knowledge sharing motivators	A lack of attention to individual motivation to share knowledge is one of the reasons of KM initiatives failures.	USA
Javernick-Will and Scott	Engineering and construction organisations	Importance of knowledge	Developers, contractors and engineers had different opinions on the knowledge that is important for international firms due to the different types of firm's source of revenue and commitment time horizon.	USA
Robinson et al.	Construction industry	The use of KM	The link between KM and business strategy must be taken into consideration for a successful implementation of KM.	UK
Sverlinger	Technical consultancy firms	KM implementation	The project-based nature of design companies and the organisation of tasks predominantly around projects rather than around departments explain why knowledge transfer in design companies is mainly from other companies participating in the same project organisation.	Sweden

Specifically regarding the use of IT (information and technology) in knowledge management, Forcada et al. notes that according to the results of prior studies, the use of technology in KM is generally only being adopted by larger firms who can afford the technological infrastructure required. It is generally perceived as a tool for assisting in KM, but does not necessarily motivate project stakeholders to share their knowledge. There are several types of construction knowledge that cannot be regulated by or shared with IT. The successful sharing and dissemination of this information throughout the organisation will only occur through a mutual trust between project stakeholders and the organisation, with assistance from systems and IT. Forcada et al. concludes by noting that there are multiple KM strategies available for use by construction firms, but that there is no single solution that will be the most effective for every

scenario. The strategies adopted will vary depending on factors such as the organisation's size, structure, people issues, and IT availability. (Forcada et al. 2013, p. 85).

2.3 – Knowledge Management Dimensions

Understanding how each stage of knowledge management works and interacts with other stages is key to successful KM. How effective KM is achieved depends on the company culture, structure, and aims. Construction knowledge is useful only in proportion to its ability to increase construction productivity. Therefore, KM must be implemented in construction firms to ensure maximum usefulness of the knowledge available to an individual or company. Ideally, a Chief Knowledge Officer (CKO) should to be appointed to manage the company's knowledge assets in much the same way as the CFO manages its capital. (Demarest 1997, p. 375).

There is no universally accepted view on the dimensions or process of knowledge management. In previous studies, the authors have identified and classified different dimensions that were appropriate to their study, as shown in Table 2.2 below:

Table 2.2: Dimensions of Knowledge Management in prior studies (Uzunboylu, Yusof and Bakar 2012)

AUTHORS	KNOWLEDGE MANAGEMENT DIMENSIONS
Gold et al. (2001)	KM capabilities consist of four interrelated processes including knowledge acquisition, knowledge conversion, knowledge application and knowledge protection.
ChinLoyetal.(2007)	KM has six sub-scales namely knowledge creation, knowledge capture, knowledge organisation, knowledge storage, knowledge dissemination and knowledge application.
Chen and Mohamed (2008)	KM has four dimensions namely responsiveness to knowledge within the business environment, knowledge acquisition, knowledge dissemination and knowledge utilization.
Fong and Choi (2009)	KM is divided into six process including knowledge acquisition, knowledge creation, knowledge storage, knowledge distribution, knowledge use and knowledge maintaining.
Zack et al. (2009)	KM as observable organisational activities that related to the ability to locate and share existing knowledge; ability to experiment and create new knowledge; culture that encourage knowledge creation and sharing; and regard for the strategic value of knowledge and learning.
Liao and Wu (2009)	KM as the process of knowledge acquisition, knowledge conversion and knowledge application.
Omerzel (2010)	KM comprised five elements namely the acquisition, storage, transfer, use of knowledge and the measurement of the effects of KM.

Uzunboylu et al. agreed that the dimensions outlined by Gold et al. are the key aspects of the knowledge management process, as they include the minimum set of knowledge management activities as outlined by most studies observed. (Uzunboylu et al. 2012, p. 130).

Additionally, Demarest lists his four dimensions of KM as; discerning knowledge, choosing a container, dissemination, and the use made of the knowledge. (Demarest 1997). However, according to Yahya and Goh, there are five main dimensions of KM, being knowledge acquisition, knowledge documentation, knowledge transfer, knowledge creation, and knowledge application. (Yahya & Goh 2002, pp. 457-68).

All knowledge management models identified in the literature involve the codification and transfer of knowledge between stakeholders. Regardless of which dimensions of KM are adopted, understanding how the dimensions operate in the organisation is essential to the successful knowledge management, and (in turn) the knowledge transfer process. In addition, to be successful the process has to be explicitly supported, managed and measured through documented systems.

2.4 – Knowledge Management Classifications

Capturing construction knowledge is the driving force behind the knowledge management movement within the construction industry in Australia. Knowledge can be defined as:

> "A dynamic human process of justifying personal belief towards the truth... [it can be] classified into personal, shared and public; practical and theoretical; hard and soft; internal and external; foreground and background". (Nonaka & Takeuchi (1995) and Pathirage (2007), Cited in Uzunboylu et al. (2012, p. 129)).

The most commonly used classifications of knowledge are tacit and explicit. Tacit knowledge is accumulated through experience and learning and is often referred to as 'learning by doing'. It tends to remain with the individual who holds it, and cannot be learned from written materials. It is acquired by individuals over time through informal learning (especially at work place). In contrast to tacit knowledge, explicit knowledge can be coded, filed, and formally transferred between organisations or individuals within the organisation. (Uzunboylu et al. 2012, p. 129).

Tacit knowledge models as those which focus on the people who possess the knowledge within the organisation, and are used to develop effective ways for them to exchange their specific and valuable knowledge with others. Conversely explicit models are based around organisations having documents, databases, and intranets etc. which are used to manage specific information relating to projects and procedures. (Anumba et al. 2008).

Hansen et al. elaborate on this further, likening the explicit and tacit models to codification and personalization strategies respectively. They describe codification strategies [explicit] as systems where data or knowledge is coded and stored in databases in such a way that it can be accessed and used by anyone within the organisation. Whereas in personalization strategies [tacit], data or knowledge is tied to the person who developed or discovered it, and is shared through direct face-to-face communication. The purpose of IT in this strategy is to help communicate or transfer knowledge, but not to store it. (Hansen et al. 1999).

Explicit and tacit knowledge (relation to systems), can also be likened to the product and process views of knowledge management. The product view [explicit]:

> "implies that knowledge is a thing that can be located and manipulated as an independent object [whereas the process view - tacit] places emphasis on ways to promote, motivate, encourage, nurture or guide the process of knowing, and abolishes the idea of trying to capture and distribute knowledge" (Massingham 2014, pp. 1075-100).

The product view is based on the management of structural capital, through document management systems, processes, databases, and formal communications. By contrast, the process view of KM doesn't separate knowledge from the person or people who obtain it, but revolves around a social capital basis, where information and knowledge is shared through effective communication and collaboration. Massingham notes however that whilst it would be desirable, it is unrealistic to expect the process view of KM to work seamlessly with relation to construction project management, as organisations either have in place (or desire to have in place), product-view based knowledge management systems and toolkits, which can be standardised over all projects. (Massingham 2014, pp. 1075-100).

Birkenshaw (2001), (cited by Anumba et al.) states that "knowledge management is never zero based; to make it work you need to recognise that you are already doing it" (Anumba et al. 2008, p. 52). All construction companies have some form of formal or informal KM in place (generally explicit), in order to manage and file project documentation, subcontractor quotations, construction contracts etc. It is important to continually evaluate the effectiveness of the existing systems or processes however, in order to devise and implement improved KM solutions for the future. Many organisations have benefitted from exploring improvements to KM in terms of people, processes, and technology. (Anumba et al. 2008, pp. 23, 35, 97).

Whilst other classifications such as process and product views, codification and classification, and personal, shared and public classifications of knowledge management systems have been identified, the majority of the literature indicates that tacit and explicit classifications of KM models are the most commonly used and understood. As such, these will form the basis of any further classifications of knowledge management. Figure 2.1 visibly demonstrates the differences between tacit and explicit knowledge:

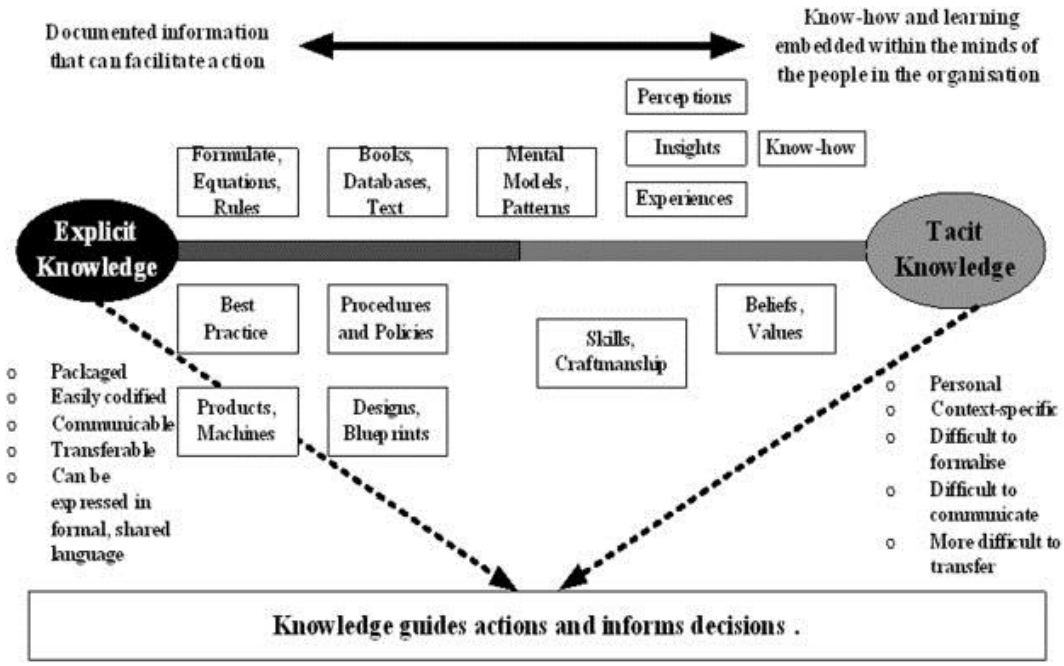

Figure 2.1: Tacit and Explicit Knowledge (Udeaja et al. 2008)

2.5 - Knowledge Management Models

Knowledge management models in engineering and construction are implemented to ensure that all information pertaining to a tender or project is accessible by all parties requiring it, and that the information is kept up-to-date at all times. (Watts 2009, p. 324). In order to track changes and ensure standardization, construction companies generally use explicit knowledge models. However, given that up to 80% of project management and project-specific knowledge is tacit and cannot necessarily be communicated by written means (without prior codification), it is worthwhile researching the implementation of a tacit KM model into existing estimating and project management team systems. (Anumba et al. 2008, p. 53).

Due to the disjointed nature of the construction industry (both in Australia and internationally) and the ad-hoc nature of construction projects, capturing and reuse of valuable knowledge gathered during a construction project poses a significant challenge. Often critical mistakes are

repeated on multiple projects, and project management teams are constantly "reinventing the wheel". As such, collaborative knowledge management is a solution which enables the capture of project knowledge. There are multiple IT solutions for this, including contact lists, databases, standard procedures and forms, and newsletters. Although the implementation of these technologies has transformed how knowledge is shared within construction companies, they still mainly address the capturing and transfer of explicit knowledge rather than tacit knowledge. (Dave & Koskela 2009, pp. 894-902).

Dave and Koskela discuss the importance of collaborative knowledge management in construction companies. In contrast to traditionally explicit KM technologies, technologies such as social networking platforms and online forums are transforming the way project stakeholders within construction companies share knowledge and ideas with each other. These technologies are generally being adopted by organisations that are seeking innovative ways of sharing tacit knowledge, however their uptake has been (and continues to be) slow within the industry. (Dave & Koskela 2009, pp. 894-902).

McElroy, (cited by Dave and Koskela) outlines a generational approach to tacit knowledge management in construction companies. First generation KM systems involve people directly sharing information with each other by way of emails, letters, intranet, document portals etc. Second generational KM systems involve employees working together to create knowledge. McElroy's models do require that first generational KM comes first – knowledge sharing is the first step to successful knowledge management, however it doesn't necessarily lead to innovation. In many construction companies, shared knowledge (captured in standard forms etc.) often becomes stagnant and is seldom used or referred to. Second generational knowledge management is a social process which can be supported by information technology; "Knowledge creation starts off with an employee bringing an idea across and other members of the organisation take the idea through a lifecycle of feedback and refinement" (Dave & Koskela 2009, pp. 894-902).

2.6 – Capturing and Reuse of Project Knowledge

2.6.1 Current practises:

The management of knowledge in construction works at two different levels; the management of project-specific knowledge, and the management of knowledge within the organisation. According to Kamara et al., the most common approach to capture learning from construction projects is the post-project evaluation The evaluation can be very useful, however the

evaluation does not necessarily provide an effective framework for the capture and re-use of learnings on future projects. Therefore, even if the knowledge is made available, there is no guarantee it will be taken on board for future use. The heavy reliance on people within these processes exposes a vulnerability for organisations due to the high turnover of staff (generally) within construction. (Kamara et al. 2003, p. 178).

Some examples of recent research projects undertaken regarding the potential applications of knowledge management in construction are summarised in Table 2.3 (below).

Table 2.3: Summary of recent research projects undertaken regarding knowledge management in construction. Adapted from (Udeaja et al. 2008, pp. 839-51)

ACRONYM / TITLE	AIM OF RESEARCH PROJECT	SOURCE
Knowledge Management for Improved Business Performance (KnowBiz)	Aimed at establishing the link between knowledge management and business performance in construction firms.	A. Robinson et.al 2003
Creating, Sustaining and Disseminating Knowledge for Sustainable Construction: Tools, Methods and Architecture (CSanD)	The aim to provide mechanisms for ensuring knowledge pertaining to sustainability is captured and distributed in a structured manner.	M. Khalfan et.al 2003, PP. 19-21
A CLEVER approach to selecting a knowledge management strategy	Focused on the development of a framework for the transfer of knowledge in a multi-project environment in construction. The framework developed assists construction firms in selecting an appropriate strategy for the transfer of knowledge that is appropriate to their organisational and cultural contexts.	J.M. Kamara et.al 2002, pp. 205-211
e-COGNOS - COnsistent knowledGe maNagement across prOjects and between enterpriSes in construction	Focused on specifying and developing an open model-based infrastructure and a set of tools that promote consistent knowledge management within collaborative construction environments.	e-COGNOS 2001
KLICON - Knowledge and Learning In CONstruction	Focused on the role of IT in capturing and managing knowledge for organisational learning on construction projects.	M.B. Patel et.al 2000
Project memory capture in globally distributed facility design	Focused on the development of a project memory capture system for design evolution capture, visualisation and reuse in support of multi-disciplinary collaborative teamwork (Undertaken at Stanford University)	K. Reiner, R. Fruchter 2000, pp 820-827
Retrieval of project knowledge from heterogeneous AEC documents	Focused on the retrieval of explicit project knowledge from heterogeneous documents (Undertaken at Dresden University of Technology)	R.J. Scherer, S. Reul 2000, PP 812-819

The above summary indicates that there is an increasing interest within the industry in knowledge management for construction projects. However, the majority of construction companies in Australia still have significant gap between their current practices and best

practice in KM strategies. These organisations need an approach which is capable of capturing live project knowledge, irrespective of the type of project, the phase of the project, or the type of knowledge. (Udeaja et al. 2008, pp. 839-51).

2.6.2 Shortcomings of current practises:

Tan et al. provides a detailed summary of the shortfalls associated with the current practise of gathering project knowledge through a post-completion review:

- It does not provide an opportunity for the learnings to be implemented to improve the current project (as it is too late).
- Most knowledge resides with individuals, who may move to another project or organisation prior to providing this knowledge to others.
- The information gathered can be difficult to interpret, given that it usually relates to specific learnings from specific projects.
- The intent behind particular decisions is rarely documented, therefore the decision making processes are not always clear.
- Within firms, there is usually an expectation for the lessons to be distributed through department or divisional heads, which can be difficult if they are handling information they do not understand as it was not directly learned by them.
  (Tan et al. 2009, p. 18)

Furthermore, Kamara et al. highlights that whilst individuals will likely take their own lessons learnt forward, there is a possibility that future errors or mistakes could be avoided by their peers if their knowledge could be effectively shared. Furthermore, the post-completion reviews are often undertaken as a formality, as a part of the overall project Quality Assurance system, with very little time or effort invested from all parties. (Kamara et al. 2003, p. 178).

It is evident in the literature that whilst knowledge management systems do currently exist within the construction industry, a revised approach is required to ensure that both tacit and explicit knowledge is captured for distribution. It is evident that individual lessons can be learned over the course of a project, and that for maximum efficiency with minimal loss, these lessons should be distributed to all project stakeholders, and the wider organisation. The most effective way to distribute these lessons is through a knowledge capture and transfer system.

2.7 – Knowledge Capture and Re-Use Strategies

Udeaja et al. proposes a strategy for live knowledge capture based on four key pillars: Reusable project knowledge (RPK), the project knowledge file (PKF), an integrated workflow system (IWS), and a project knowledge manager (PKM). RPK is generated from various knowledge or learning situations where knowledge can be created or identified over the duration of the project. It is then categorised and stored in the PFK. (Udeaja et al. 2008, pp. 839-51).

The Project knowledge file is an online database where project knowledge is stored and made available to project stakeholders. The kind of knowledge which is captured must be pre-determined as knowledge that will be beneficial for use on the existing and future projects. The long-term goal of PKF's is to develop a learning history for all projects within the organisation. In order to ensure as many project learnings as possible are captured, all project stakeholders should contribute to the PKF. (Kamara et al. 2003).

The purpose of the integrated workflow system is to implement the PKF by facilitating the capturing of knowledge and (in turn) creating the desired learning history for the project. A generic workflow model will be produced, which can then be fine-tuned to suit the needs of each project. The IWS is triggered when a learning event occurs. Examples of learning events include (but are not limited to); Site inspections, trade lettings, site conditions affecting works unexpectedly, safety incidents, and how each of these are dealt with by the project team. Essentially a learning event is any event from which RPK is generated. (Kamara et al. 2003).

The project knowledge manager (usually the project manager) oversees the entire knowledge system. They are in charge of the updating and management of both the PKF and IWS. The PKM must have an understanding of developing learning histories. (Kamara et al. 2003).

Zhang and Li discusses the heterogeneity of project knowledge (that there is a vast diversity of the skills and knowledge within project management teams), and that but only a small fraction is reused subsequently, leading to a majority of the knowledge gained from the project being lost and not shared effectively. Zhang and Li agrees that project knowledge must be effectively captured and re-used, stating that:

> "Through reusing existing knowledge, an individual can receive benefits of saving time and effort and ensure the quality of knowledge... knowledge reuse improves the team ability, innovation ability, survival ability and competition ability". (Zhang & Li 2016, pp. 1138-49).

The development of a strategy for live capture of project knowledge involves both tacit and explicit concepts. Kamara proposed the following methodology for developing an effective live capture of project knowledge (for re-use):

- Step 1: An investigation of the current practice of knowledge capture and identification of the requirements for knowledge reuse by end users of project knowledge. This will ensure that the right kind of knowledge is captured to avoid knowledge overload
- Step 2: An exploration of the concepts and techniques that would facilitate the 'live' capture of reusable project knowledge in the construction industry
- Step 3: The development of a methodology for the live capture of reusable knowledge on construction projects;
- Step 4: The testing of the methodology on a web-hosted project environment (for easy access to all project respondents) and evaluate its effectiveness using live projects.

  (Kamara et al. 2003)

Over the duration of a construction project, learning occurs not only from critical construction events, but also from day-to-day activities at any phase of the project (including pre-construction, during construction and post-construction). Within the knowledge capture procedure, knowledge will be accumulated in the project knowledge file, for current and future use. Kamara et al. provides an overview of the knowledge capture system which is similar to that proposed by Udeaja et al. (Refer Figure 2.2). (Kamara et al. 2003).

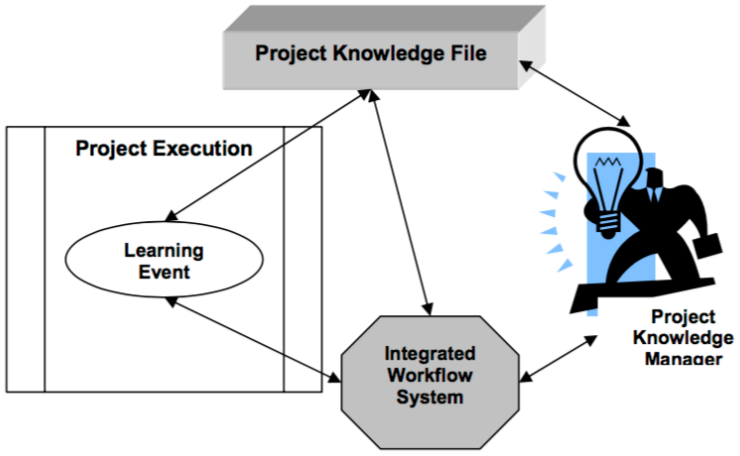

Figure 2.2: Overview of the Knowledge Capture System (Kamara et al. 2003)

The literature indicates that the implementation of knowledge capture and re-use systems in construction projects should increase effectiveness, efficiency, and quality, through a continuous feedback loop between all project stakeholders. This could include (but is not limited to) project managers, site managers, safety officers, estimators, tender submissions teams, financial teams, and group or team managers. The system should be accessible for all (ideally through an online system), and must be maintained and managed by one or more trained individuals to ensure that only high quality knowledge is distributed for re-use.

2.8 – Knowledge Transfer in Knowledge Management Systems

Knowledge Transfer involves taking the (accessible) knowledge that already exists (from the PKF), and applying this knowledge to develop new improved construction processes or procedures. It a key component in the knowledge management system, as the aim of any KM process is to ensure that accurate information with the correct context, flows through the various stages of the project, to the necessary stakeholders, in the right timeframe. The processes that outline how communication is to take place between project stakeholders, companies and individuals, are known as knowledge transfer models. (Anumba et al. 2008).

Knowledge transfer models are not autonomous – that is, they require continuous input from each learning event to ensure that they remain effective and current. Generally, construction companies in Australia employ a number of senior personnel in various management roles (at both company and project levels), who have captured tacit knowledge and experience over their careers. However, construction is a relatively transient industry, with staff moving from one organisation to another frequently. (Forcada et al. 2013, pp. 83-91).

It is not un-common for projects to have multiple staff (each with their own body of knowledge) either leave or arrive mid-way through the project duration. This makes the immediate capture of project knowledge and its transition into the PKF a priority for the project knowledge manager. Equally, older project staff could (and often do) retire and leave the industry before their wealth of (both tacit and explicit) knowledge is passed on or collected, codified, and stored. The challenge in implementing successful KM is to retain as much of this knowledge as possible. (Anumba et al. 2008).

Liyanage agrees, stating that knowledge mainly originates from an individual's personal learnings. It stems from information being found (generally through a learning event) that has been interpreted by the individual and then applied to the purpose for which it is needed.

Liyanage notes that generally knowledge is different from expertise, which is a deep knowledge and understanding of a certain topic, which is far above average. It is built up through through experience, training and education and develops over long period of time (usually many years) and unless communicated or passed down, remains with that person. (Liyanage et al. 2009, pp. 118-31).

When completing a project tender, the estimator and their team builds up a detailed body of project knowledge. This includes how and why different pricing was implemented (subcontractor quotes, rate schedules etc.), the site conditions, client relationships, contractual information, and project-specific challenges which may occur. Generally, they will also have proposed solutions to challenges that they identify, to mitigate risk to the company. The project delivery team then attempt to maximise the project performance through the integration of their personal construction knowledge in the building process. (Davies & Zaidi 2011).

Anumba however, highlights that this is not a simple task. The personnel that possess tacit information tend to feel that their "knowledge as power" and as such, can be reluctant to share their experiences and learnings, even within their own organisation. The challenge in implementing effective knowledge transfer is ensuring this tacit information is transferred between teams. (Anumba et al. 2008).

2.9 – Communication in Knowledge Management systems

Communication is arguably the most important aspect of project management, as without effective communication, projects are destined to failure. (Emmitt & Gorse 2006). Therefore, the most important factor in improving knowledge transfer is communication. Knowledge transfer is the conveyance of knowledge from one place, person or ownership to another. Therefore, for ideal knowledge transfer, good multi-way communication channels should be encouraged between all stakeholders. (Davies & Zaidi 2011). A key challenge is to ensure that there is effective communication between these teams at all times, from project commencement through to completion. (Anumba et al. 2008).

The aforementioned theories and models of knowledge transfer have stemmed from the basic principal of communication of information or knowledge between the source (or sender) and receiver, through the PKF. Liyanage agrees with this, noting that from the perspective of social sciences, two main points can be taken to explain the processes of knowledge transfer. The first is that any knowledge transfer process (from either tacit or explicit models), has two main

components, i.e. the source or sender that shares the knowledge, and the receiver who acquires the knowledge. Secondly; knowledge transfer is complex due to various factors and contextual issues surrounding the process. (Liyanage et al. 2009, pp. 118-31).

There are four ways in which knowledge can be captured and transmitted; internalisation, externalisation, socialisation, and combination. By combining different bodies of explicit and tacit knowledge, these categories of knowledge are created. Figure 2.3 visibly demonstrates both the tacit and explicit modes of transferring knowledge and receiving knowledge:

Explicit to tacit **(Internalisation)** Learning and acquiring new tacit knowledge in practice	Tacit to explicit **(Externalisation)** Articulating tacit knowledge through dialogue and reflection
Tacit to tacit **(Socialisation)** Sharing and creating tacit knowledge through direct experience	Explicit to Explicit **(Combination)** Systemizing and applying explicit knowledge and information

Figure 2.3: Modes of knowledge transfer – Adapted from (Liyanage et al. 2009)

Emmitt and Gorse state that all projects will experience unique opportunities, threats, and challenges over their lifecycle, despite the best intentions of all project stakeholders. They propose that this is often due in part, to inefficient or insufficient communication between project stakeholders over the course of the project, leading to information gaps and errors. Generally, they note that most organisations who do not pay as much attention to improving communication lines between their staff, as well as communication skills of their staff, suffer. Emmet does note however that this is a complex topic, and there is no "one size fits all" solution for effective information transfer between teams – other than that knowledge must also be correctly contextualised in order to be interpreted by the receiver. (Emmitt & Gorse 2006).

2.10 – Handover between Estimating and Project Management Teams

The tender "defines the sums of money allowed to construct the various elements of the project. It is the yardstick against which all resources used on the project are measured" (Holroyd 2003, p. 119). The Code of Estimating Practice (1994) states that the handover meeting is held soon after a project is awarded, but ideally before the contract has been signed by all parties and is the medium by which the tender is handed over from the estimating to project management teams.

Tender handover is the process by which all information and project-knowledge relating to a successful project is transferred between the estimating team and project management teams. Generally, this is completed at the tender handover meeting, which occurs after a project has been secured by the organisation and a team assigned. To avoid argument or confusion over the information provided by the estimating team, the meeting should be minuted. (Greenhalgh 2013, p. 158).

The handover should include all appropriate information on which the estimate and tender pricing were based. Greenhalgh provides an indicative list, including:

- Any prequalification questionnaires together with the company's responses
- Actual tender documents originally received from the client/consultants, including all amendments and addendums
- All tender query lists with client responses
- All correspondence during the pre-contract stage with the client and design team/consultants
- A copy of the for of tender actually submitted.
- All priced bills of quantities/other pricing documents which built up the tender price; the rates should be adjusted to take account of any negotiations, clarifications, or queries during the tender stage.
- Calculations of the build-up of rates included in the bill of quantities, including allowances and changes made at tender review
- Pre-tender method statement and pre-tender programme/schedule
- All quotations received from suppliers and subcontractors, including internal analysis of these quotations
- Project overheads submitted as part of the tender
- Estimator's notes and report submitted to the review committee
- Notes and report from any tender stage site visit
- Any further information received after the tender submission.
  (Greenhalgh 2013, pp. 155-7)

Holroyd agrees with Greenhalgh, stating that this tendering information is invaluable to the project delivery team. It includes explicit information such as the project scope of works, head contract, plans, tender addendums, and building specifications. (Holroyd 2003, pp. 119-20). In addition to the tender documents provided to the estimating team, they will usually produce or calculate bills of quantities, an analysis of subcontractor pricing, allowances for overheads and

profits, site inspection reports, photos, client or superintendent correspondence, and tender qualifications and/or clarifications. Ideally the estimating team will also provide insight into the project knowledge that they have captured during the tender period. This could include information on relationships with the client, suppliers or subcontractors, industry trends, project build methodology, or a SWOT (strengths, weaknesses, opportunities, and threats) analysis. (Holroyd 2003, pp. 119-20).

Greenhalgh states that the handover meeting also provides an opportunity for the estimating team to provide tacit knowledge, such as detailed reporting on the key decisions made at tender time regarding project build methodology, subcontractor selection (both who and why), proposed site layouts, project risks, and potential value adding which has been identified at tender time. The meeting must be minuted, with all respondents acknowledging this by signing the meeting minutes. (Greenhalgh 2013).

The Standards Association of Australia have released the Australian Standard Code of Tendering (1994) which pertains to Construction tendering. The standard was developed to ensure that the construction industry is held to a high standard of ethics in tendering operations. It does not stipulate a procedure, process or guideline however, for the transition of a tender to construction, but is a guideline as to the processes involved in producing the tender offer.

2.11 – Proprietary Document Control and Management Systems

Document control in engineering and construction ensures that all information pertaining to a tender or project is accessible by all stakeholders who require it, and that the information is kept up-to-date at all times. (Watts 2009, p. 215). Information is commonly stored and managed electronically, in what is referred to as Electronic Document Management Systems (EDMS). Therefore, information must be able to be organised, presented, managed, maintained, and disposed of when required, with relative ease and traceability, through the EDMS. (Hicks 2007, pp. 233-49).

Kalle and Jukka agree with this, stating that construction project management is heavily invested in document control, requiring it for daily events including (but not limited to), site instructions (SI's), architect's instructions (AI's), requests for information (RFI's), document transmittals, meeting minutes, and variation price requests (VPR's). (Kalle & Jukka 2015, pp. 7-23). Functionalities such as these usually form the core of a construction company's EDMS. They point out that the more features an EDMS contains, the more complicated it becomes.

Therefore, the level of complexity in learning to use any EDMS solution corresponds with the number or features and functions of the system. Whilst they are a huge benefit to organisations, the use of various and overlapped procedures within the EDMS can cause unnecessary data re-entry and communication problems. (Arnold & Javernick-Will 2012, pp. 510-8).

The Merriam Webster dictionary defines Information communication technology (ICT) as "the technology involving the development, maintenance, and use of computer systems, software, and networks for the processing and distribution of data" (Merriam Webster 2016). Arnold and Javernick-Will state that construction management experts have been suggesting since the 1980s that electronic information and communication technologies (ICTs or EDMS) would grow quickly to increase the efficiency and effectiveness of communication in the construction (AEC) industry. Since then, studies have measured the rate of adoption and effectiveness of these tools, and have noted that these tools are not being used universally and are not increasing the efficiency of communications as quickly as predicted, due to slow uptake. The results of these studies also indicate that data reentry is a common source of inefficiency in the use of EDMS and that future systems should focus on implementing a more collaborative, project-based EDMS that allows direct and active access by all project delivery stakeholders. (Arnold & Javernick-Will 2012, pp. 510-8).

As noted by Harris, McCaffer and Edum-Fotwe, document control in EDMS is essential for effective and successful tendering and project delivery. Concise control of project documentation is vital for ensuring that tasks are completed on time and on budget, as well as meeting the needs of quality control for the project. EDMS' have become commonplace in the construction industry in Australia. They provide a combined set of organisational tools for all aspects of controlling project documentation and explicit information. By improving on the efficiency and ease-of-use of the EDMS, construction productivity can be considerably improved (Harris et al. 2013).

There are multiple proprietary document and information management systems available for use by construction companies in Australia. In 2013, the sponsor commissioned a study into whether or not to implement a cloud-based proprietary system to replace their ageing document management systems, (either Aconex or TeamBinder).

Aconex was founded in the year 2000 in Australia, when document control and distribution was primarily still paper-based in the construction industry. (Abeysekera 2011, p. 147). Given

that construction projects generate thousands of documents, the distributing and management of them in hard copy format was time consuming, expensive, open to human error, and required large physical archiving spaces upon project completion. Aconex was therefore "devised as a solution for online document management on construction projects; it is a system that leverages the power of the internet to streamline communication and improve collaboration" (Abeysekera 2011, p. 148).

Aconex is as an application service provider, meaning that it does not require software to be installed on individual client devices, but rather is operated by way of a web browser. A summary of the main features of Aconex, adapted from Taylor et al. is as follows:

- It allows for correspondence management, including a facility which can scan, store and distribute letters, documents or other written correspondences including automatic filing of faxes from lines registered with the system.
- Management of RFI's, variations, memoranda, AI's, transmittals, quotes, SI's, schedules, VPR's and reports.
- It allows for simultaneous viewing and mark-up of documents with real time instant messaging.
- Includes support for Aconex Site Cams (time lapse photography) to capture the full history of project. Images are stored every 15 minutes and can be viewed remotely.
- Automated document and correspondence distributions and notifications.
- Additional, integrated modules and services for task management, project and company workflow management, and the time consuming process of issuing and awarding tenders.

  Taylor et al. (2009, pp. 78-9).

TeamBinder was also developed in Australia, by QA Software. Similar to Aconex, it is an online-based collaboration tool for communication and sharing of project documents, however it can operate either as a browser-based solution, or can be installed on a client server. (Wilkinson 2005, p. 37). Documents are automatically uploaded, validated, distributed and approved through the TeamBinder program. The documents are uploaded through email and validated by TeamBinder through pre-determined rules that are established at project commencement. This process is illustrated in Figure 2.4 below:

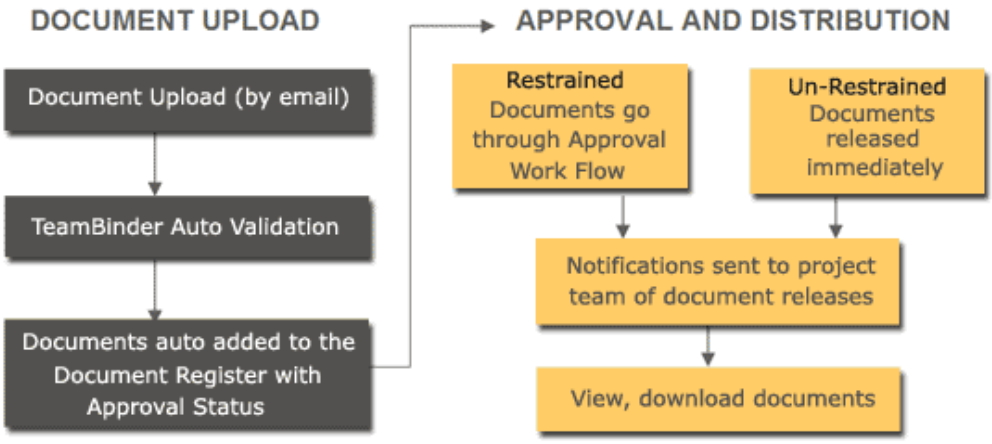

Figure 2.4: Document management process in Team Binder. Source: www.qa-software.com, cited in Taylor et al. (2009, p. 80)

A summary of the main features of TeamBinder, adapted from Taylor et al. (2009) is as follows:

- Documents are uploaded to a central register and managed via a document register.
- Document distribution is controlled via a document matrix which controls what documents will be sent to particular recipients
- Documents in Team Binder are distributed via notifications and downloads, and also through transmittals.
- All document downloads and other transactions are maintained in an audit trail.
- Team Binder has built-in viewing. Uploaded files are automatically converted to a common format on the server and viewed via Internet Explorer.
- It tracks the project correspondence through emails trails

  (Taylor et al. 2009, p. 81)

Despite the evident benefits of proprietary document and information management systems, Wilkinson notes that some organisations have no need for such systems, having already developed their own bespoke solutions to suit their individual needs (Wilkinson 2005, p. 38). The result of the 2013 study by the project sponsor, was that the implementation of a proprietary system was not a viable option at that time. This was due to the upfront and ongoing costs, information technology requirements, and usability (Carter S, 2016, pers.comm June 2016). As such it was determined that employing EDMS efficiency improvements internally was a viable option for the continued operation of the construction division of the company.

In 2014, the sponsor trialled a revised document filing and management procedure for tendering, which standardised the electronic filing and distribution of tender documentation through EstimateOne. EstimateOne is an online document portal which is used for the

distribution of project documentation to selected subcontractors (maintained in the head contractor's private online database). It provides tracking for the Head contractor to see which documents have been downloaded by subcontractors, and can provide summaries of this information for export (EstimateOne 2016). It is similar in operation to either TeamBinder or Aconex in that documentation is distributed directly to subcontractors and the system operated through a web browser, however all documentation must be manually uploaded and managed by the head contractor. According to Scott Carter (2016, pers.comm June 2016), EstimateOne was implemented by the sponsor as an interim measure in 2014, however remains in use currently as it is both cost effective and has been embraced by the estimating and project management teams.

2.12 – Implementing Change in Construction Companies

One of the challenges involved in the implementation of any new systems or process improvements in construction is the attitudes towards change of key project stakeholders. Weippert and Kajewski state that every company within the construction industry has its own unique culture, which reinforces or challenges the 'way of doing things' in the organisation. Unfortunately, the transformation of personalities (culture) and traditional processes within any organisation, team or group is not easy, characteristically hindered by the construction industry's unique and determined way of 'doing things' the way it always has, and by its deeply embedded and resistive nature to change. (Weippert & Kajewski 2004).

Patricia, Martin and Rachel elaborate further, demonstrating that the outcomes of implementation efforts have not been consistently successful, suggesting that up to 70 per cent of process re-engineering efforts in the construction industry are unsuccessful. Patricia et al. (2005, pp. 470-86). They state that the reason for this is related to mis-management of the change process within companies. Often they look to reduce overall change costs by expecting individuals to execute new working practices without appropriate training or awareness of need. This lack of training and education is partially responsible for wide-held scepticism and lack of acceptance by project stakeholders when processes are implemented. (Patricia et al. 2005, p. 486).

Li, Liu and Liu confirm this, suggesting a failure rate of knowledge management projects ranging between 50% to 70%. Furthermore, in the management literature, the concept of resistance to change was created by Kurt Lewin in 1947. His theory was that the status quo represents an equilibrium between barriers to change and the forces favouring change (Li et al.

2016, pp. 189-200). A further factor that has contributed to unsuccessful implementation outcomes is that producing clear evidence of performance improvement not easy, especially in project environments like construction. It can be difficult to clearly compare results between projects due to their uniqueness, and it is also hard to establish links between the performance of a project and the use of a process model. (Patricia et al. 2005).

2.13 – Lean Construction Theory

Lean construction an approach to the management of a project or task that is aimed at reducing or eliminating waste, increasing productivity and reducing or eliminating risk. The wastes eliminated are not necessarily physical construction waste but can include wasted time and unnecessary effort. The result of eliminating as much waste as possible, is increased productivity, value, and improved outcomes. (Marhani et al. 2012, pp. 87-98). Despite being studied by academics for over twenty years, lean construction is still considered to be an ill-defined concept, requiring further exploration (Thaís da et al. 2012, pp. 512-25).

Lean construction theory was first applied several years after it had gained significant momentum in manufacturing. Its application to the built environment was first discussed by Lauri Koskela in 1992. He investigated what he (then) referred to as "the new production philosophy" and its application to construction. (Jørgensen & Emmitt 2008, pp. 383-98). Later (in the year 2000), Koskela argued that efforts to improve the "production" (being the outputs of construction – buildings and structures) suffer from the absence of a general theory of production, focusing on transformation, process and value. Koskela's work formed the foundations for what has become known as lean construction. (Jørgensen & Emmitt 2008, pp. 383-98).

According to Marhani, Jaapar and Bari, Koskela identified eleven basic principles which revolved around simplifying processes, continuous improvement, transparency, and increasing efficiency. Later these were simplified further by others to form the Five Lean Construction Principals, which are; Specified value from the client's perspective, Mapping the value stream, Making the value-creating flow, establishing client pull at the right time, and pursuing perfection for continuous improvement. They also note that lean construction principals must be applied to a whole process, rather than focusing on improving individual aspects:

> "Lean principles can only be applied fully and effectively in the construction industry by focusing on improving the whole process, integration among the

stakeholders of a project and increase transparency especially on health and safety issues". (Marhani et al. 2012, pp. 87-98)

The five principals identified are demonstrated in Figure 2.5 below:

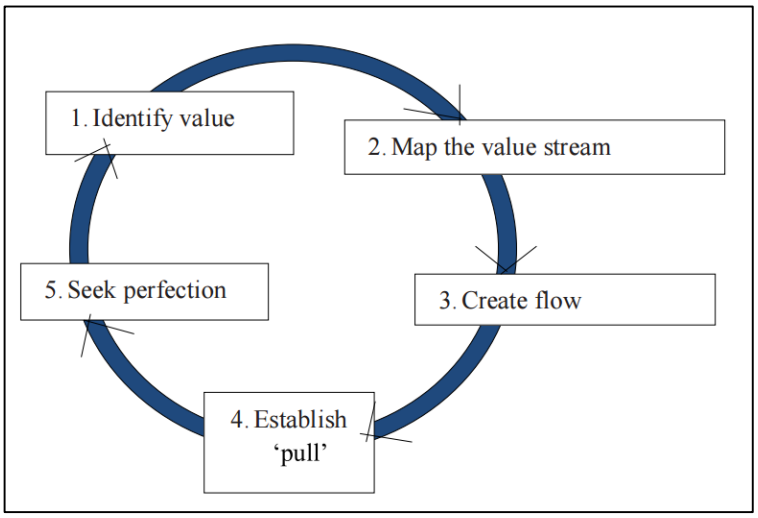

Figure 2.5: The 5 Lean Construction Principals. Source: Lean Enterprise Institute, cited in Marhani, Jaapar and Bari (2012, p. 93)

Aziz and Hafez elaborate the application of the five lean principals, as follows:

1. Identify [Specify] Value: Value is specified by the client's needs. The value of the activities that contribute to the end product must be established.
2. Identify [map] the Value Stream: Any activity which reduces efficiency, or does not generate value to the end product must be removed from the process.
3. [Create] Flow: Ensure that there is continual flow in the activities that form the processes. The flow will optimise only once the value stream has been identified.
4. [Establish] Pull: Use pull in the construction process instead of push. This means identifying the requirement of the customer and ensuring that they receive what they need, at the time they need it.
5. [Seek] Perfection: Employment of a continuous improvement model to ensure that the result lives up to customer's needs and expectations within the agreed timeframe. (Aziz & Hafez 2013, pp. 1110-0168)

Marhani, Jaapar and Bari, Koskela also provide a summary of the key concepts derived from prior studies into Lean Construction theory, which are summarised in Table 2.4 below:

Table 2.4: Key Concepts of Lean Construction, adapted from (Marhani, Jaapar and Bari 2012, p. 94)

KEY CONCEPTS	ESSENTIAL FACTORS	AUTHORS

Just-In-Time (JIT)	Three methods linked with JIT: optimise inventories according to backward requests, construction levelling, and decreasing number of setup activities.	Salem et al. (2006)
	Related to the waste concept.	Koskela (1992)
	Continuous improvement of procedures, equipment and processes in order to reduce/eliminate waste.	Koskela (1992)
Total Quality Management (TQM)	Integrated management thinking and actions encourage organisation-wide focus on quality.	Small et al. (2011)
	An organisation's functions make continuous effort on improving quality	George and Jones (2008)
	Effective organisations need an accurate understanding of customers' expectation.	Summers (2005)
Business Process Re-engineering (BPR)	Improvement through rapid gains in performance by starting from scratch in designing the foundation business development.	Small et al. (2011)
	Business process involved any activity that was fundamental for fast delivery of goods and services to customers, or that promotes high quality and low cost.	George and Jones (2008)
Concurrent Engineering (CE)	Deal primarily with product design base, incorporating the constraints of subsequent phases into the conceptual phase and tightening of change control towards the end of the design process	Koskela (1992)
Last Planner System (LPS)	To achieve lean goals by making planning mutual and by increasing the reliability of commitments of team members	Seppanen et al. (2010)
	In construction, LPS was a method that forms workflow and deal with project variability.	Salem et al.(2005)
Teamwork	Teamwork comes naturally to people who were committed to a common purpose and hold themselves accountable for its achievement.	Excellence (2004)
Value Based Management (VBM)	Value based management approach indicates value for customers is “considered product value”, while value for the workers and project respondents was termed “process value”.	Bertelsen (2004)
OHSAS 18001	Steps taken to improve existing features, or the consistency of their application and elimination in frequency of particular undesired incidents	Mohd Yunus (2006)

Aziz and Hafez propose that lean construction is an adaptation of Japanese manufacturing principals, and given that it revolves around quality, productivity and meeting or exceeding

customer expectations, it is highly applicable to the construction industry. However, it is still in its relatively early stages of implementation and acceptance into the industry. Lean implementation begins with open-minded and committed leadership, and fosters within a culture of continuous improvement. Aziz and Hafez (2013, pp. 679-95).

From the prior research into lean construction, it can be determined that the ultimate goal of lean implementation is to provide a custom-fit management solution with zero waste or wasted efforts. The lean construction principals provide the overall goal of lean, which can be achieved through the implementation of lean tools and concepts. This project is based around identifying and applying improvements to an existing process, which will lead to increased productivity, reduced waste, better quality and an improved competitive advantage in the industry.

2.14 – Value Stream Mapping as a Lean Construction Tool

Rohac and Januska propose that most successful organisations are using lean management tools to maximise productivity and eliminate waste, but that there is no guarantee of maximum efficiency and productivity simply through their implementation. Rohac and Januska (2015, p. 520). Efficiency and productivity are brought about through continuous improvement of existing processes and procedures. Value stream management is a process-based lean tool, which allows for continuous improvement of processes to ensure maximum efficiency gains. Value stream mapping is broken into five stages, shown diagrammatically in Figure 2.6 below:

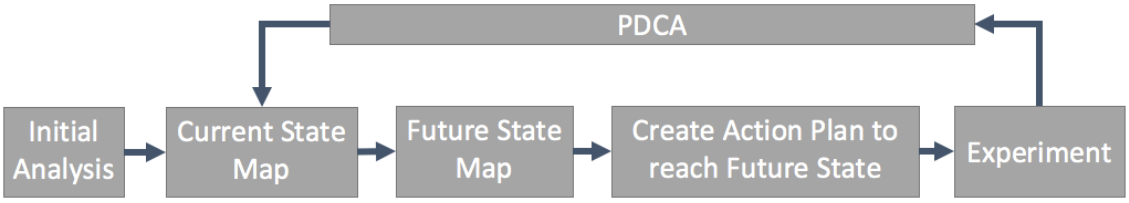

Figure 2.6: Value Stream Mapping implementation phases and their respective objectives. Adapted from (Tyagi et al. 2015, p. 210)

The objectives and processes behind each stage of VSM implementation are as follows:

- *The Initial Analysis* is the review of the current model or process, and identify the potential aspects for improvement.
- *The Current State Map* is a representation of the existing process, model, or organisation which identifies wastes associated with the current design.
- *The Future State Map* is a representation the desired process, model, or outcome which reduces or eliminates wastes associated with the current design.

- *The Action Plan* is a detailed plan that endeavors to solve the root cause of the problems identified, with an end goal of waste reduction.
- *Experimentation* is the implementation of the planned improvements, and testing their effectiveness.
- Some experimentation using the *PDCA* (Plan Do Check Act) cycle is also undertaken in order to obtain better results in reaching the future state.
  (Tyagi et al. 2015, p. 210)

Faulkner and Badurdeen state that in order to maintain successful market position, "companies must move away from using the traditional techniques that focused only on cost minimization and efficiency improvement to those that also take into account the environmental and societal implications of operations" (Faulkner & Badurdeen 2014, p. 8). Due to its success in implementation, VSM is one of the most widely used tools in lean management to identify waste which is eliminated through continuous improvement.

2.15 – Literature Review Summary

The literature review demonstrated that in Australia, there a gap in the knowledge as to any set guidelines for the capturing, codification, and transfer of tacit project knowledge between project stakeholders in construction companies. This is applicable for knowledge transfer between estimating and project management teams, as well as within these teams internally.

There are general guidelines which detail the requirement for a handover meeting to facilitate the transfer of information between Estimating and Project Management Teams. There are also proprietary software systems available to assist in the management of project information. However, given that tacit knowledge is very difficult to capture, trace or measure, there are limitations to the application of any document management system for the capture or management of tacit knowledge. Information recorded in a system can be managed, however it is tacit information and knowledge that is often missed in current knowledge and information capture strategies.

Knowledge Management was defined and discussed, as it is critical to the success or failure of construction projects. Ensuring that knowledge is distributed to all stakeholders is vital during both tender and project management phases of a project lifecycle. The role of key stakeholders with tacit project knowledge was discussed.

The issues surrounding the implementation of process changes in construction has been reviewed, as it is revealed that the vast majority of knowledge management implementation measures have failed in the past. And solutions are discussed for the successful implementation of new procedures in construction companies.

Lean construction has been defined. It embraces the practice of continuous improvement measures to ensure maximum productivity and minimum waste in construction processes. Value stream mapping, a key lean management tool, will form the basis of the project methodology for improving the transition of a successful tender from estimating to project management phases.

Chapter 3 – Project Methodology:

3.1 – Overview

With the end goal of successfully implementing process improvements relating to knowledge transfer between estimating and project management teams, the following methodology has been developed. It provides a process to be followed in order to complete the project.

The project will be completed in four stages with several sub-stages as follows: Review of relevant literature, implementation of value stream mapping as a lean tool and using it to design process changes for increased efficiency and effectiveness, testing proposed solutions, and dissertation.

The project involves significant investigation into and reporting of the sponsor's existing document and knowledge management systems, and requires involvement from the sponsor's staff. As such, permissions were obtained in order to proceed (refer Appendix A – ENG4111/4112 Research Project: Project Specification [Rev 1]). Once this was achieved, the research was able to commence.

3.2 – Literature Review Methodology

Programme item two (Refer Appendix A – ENG4111/4112 Research Project: Project Specification [Rev 1]) states that research will be undertaken into document management systems and software, knowledge capture, and the cultural response to change in construction. This was deemed the relevant literature pertaining the project aims. To achieve this objective, an extensive literature review was undertaken. Literature was limited only by its validity and relevance to the project aims, with no limit being imposed on the quantity of articles reviewed.

To ensure the relevance and validity of the literature, articles were searched in the categories of construction, project management, knowledge management, information management, lean construction etc. to ensure authenticity, the articles were to be peer reviewed. In the instance that textbooks or other forms of literature used, they were subsequently verified by peer-reviewed articles. The summaries and abstracts of these articles were examined first to determine if the literature was relevant to the research topic. Once they were deemed suitable, they were categorised into one of the following topics. These topics were extrapolated from the requirements of Appendix A – ENG4111/4112 Research Project: Project Specification [Rev 1]:

1. What is knowledge Management?

2. Knowledge Management Dimensions
3. Knowledge Management Classifications
4. Knowledge Management Models
5. Capture and Reuse of Project Knowledge
6. Knowledge Capture and Re-Use Strategies
7. Knowledge Transfer in Knowledge Management Systems
8. Communication in Knowledge Management systems
9. Handover between Estimating and Project Management Teams
10. Proprietary Document Control and Management Systems
11. Implementing Change in Construction Companies
12. Lean Construction Theory
13. Value Stream Mapping
14. Gathering opinion-based data

The literature review provided insight into the background of the topic of knowledge management, which became the main direction of the project with regards to the end result of improving document and information transition. The literature had to be fully understood in order to ensure it was relevant to the project outcomes. All articles were entered into Endnote software for future reference. The literature review forms a significant part of the research project as a whole, and is found in chapter 2 of this report. The results are referenced in Harvard AGPS 2015 Version 2 format as required.

3.3 – Establish Understanding of Existing Systems

In 2.12 – Implementing Change in Construction Companies, it was determined that one of the significant factors behind the failure of most knowledge management projects in construction companies, is a resistance to change from employees. This is brought about through a lack of stakeholder involvement, training, or understanding of need. As such it was determined that in order to successfully implement change to existing processes, employees from the project sponsor must be involved in the project.

In 2.5 - Knowledge Management Models, it is identified that the best practise for maintaining and increasing efficiency of existing systems, is to continually evaluate them. 2.13 – Lean Construction Theory highlights the need to involve stakeholders in the application of lean principals. 2.14 – Value Stream Mapping as a Lean Construction Tool refers to creating the "current state map" in order to benchmark any process improvements when mapping the value stream.

Therefore, in order to benchmark the existing procedures, and to determine the needs of the project stakeholders, input from the stakeholders was required. As such, a survey of each group was arranged. According to Trochim (2006), there are two main types of survey; the questionnaire and the interview.

Questionnaires are completed by the respondent, with little or no input from the researcher or researchers. Commonly they are completed online or by mail. They can contain either qualitative or quantitative questions, however must be straightforward as explanation of questions is generally not possible. They can be made anonymous, and are low cost in comparison to interviews (time and distance-related costs). Finally, they can also be distributed to a large number of respondents with relative ease, compared to interviews. Conversely interviews are completed by the researcher based on the views expressed by the respondent. They generally take a longer amount of time to complete than surveys with the same number of questions, however they are flexible in nature and allow for the explanation of the questions (Trochim 2006).

With regards to which survey style to use, Trochim notes that there is no set way in which to decide a survey type, but that the advantages and disadvantages of each survey type and the goals of the survey will dictate the style selection. He provides an outline of considerations to be made as follows:

- *Population*: Can the population be counted? Is the population literate? Are there language or interpretation issues? Will the population cooperate? What are the geographic restrictions?
- *Sampling*: Can all members of the population be sampled? Are response rates likely to be a problem?
- *Questions*: What types of questions can be asked? How complex will the questions be? Will screening questions be needed? Can question sequence be controlled? Will lengthy questions be asked?
- *Content*: Can the respondents be expected to know about the issue? Will respondent need to consult records?
- *Bias*: Can social desirability be avoided? Can interviewer distortion and subversion be controlled? Can false respondents be avoided?
- *Administration*: Cost? Available Facilities? Time available to complete? Research Personnel?

(Trochim 2006)

The aim of surveying the respective estimating and project management teams is to create a semi-structured interview or questionnaire that provides respondents from each team with relevant, meaningful and appropriate response categories, or the opportunity to provide a meaningful response to an open question. To gather and summarise these responses in order to develop process improvements around handover procedures.

The project sponsor's estimating consists of a team of 8 Estimators, 1 Manager, and 1 Administrator/Assistant. The majority of the team operate out of a single office, located in Brisbane. Two estimators operate remotely from the team (in their Toowoomba office), and the estimating assistant operates from both offices. The estimating team is heavily involved in the current processes relating to document and information transfer. As a requirement of their roles, they must have a comprehensive understanding of the existing systems in order to complete each step of the existing process. As the sample size of potential respondents in the Estimating team was small, there is an opportunity to conduct an interview with each team member without it being time prohibitive. As the research project is being undertaken from Brisbane, the team operates locally, so face-to-face interviews are suitable. Additionally, as the team's knowledge of existing operations is detailed, it is possible to ask open questions to gather a better understanding of the opinions and thoughts of respondents.

The project sponsor's project management consists of approximately 60 Project Managers, Contracts Administrators, and Cadets, who are overseen by 5 Operations Managers. In addition, there are other "hands-on" staff including site managers, safety officers carpenters, and apprentices who are not directly involved in the transfer between estimating and project teams. The teams are managed out of six offices (Toowoomba, Brisbane, Cairns, Townsville, and Mackay QLD, and Newcastle NSW), however the majority of project management teams are physically based on construction sites. The geographical spacing and size of this team rules out face-to-face interviews, due to prohibitive time and financial restraints. As such a questionnaire approach will be developed, which can be sent via email to each respondent. Whilst the questions will be similar in subject content to the estimating interview, they will be closed questions with straightforward answers, or checkbox or scale style questions. They will relate directly to the quality of documentation and information received during tender handover, and so would be limited to the Project Managers, Contracts Administrators, and Cadets, who receive and process this information.

With both the interview and the survey, questions must be written in a manner which does not direct the respondent to answer one way or another, so that is there is to be no interviewer bias. This will be achieved by omitting all personal wording with the exception of that relating to the respondent, and by ensuring that the use of adjectives is minimalised. In addition, the questions will be reviewed by the project sponsor, to ensure they are in no way defamatory or misleading.

3.4 – Implementation of Value Stream Mapping for Process Redesign

2.13 – Lean Construction Theory refers to the implementation of lean principals, which are: identifying value, mapping the value stream, creating flow, establishing pull, and seeking perfection. The five principals will be applied in conjunction with the implementation of VSM to redesign the Estimating Handover Process:

3.4.1 The Initial Analysis:

The initial analysis is undertaken in 3.3 – Establish Understanding of Existing Systems through the surveying of estimating and project management stakeholders. The interview and survey results will be analysed to determine the information and project knowledge required by the project management teams (identifying value), as well as the information and project knowledge which the estimating team considers to be valuable. The value of time will also be discussed with stakeholders, and how much time is invested in the existing handover process will be determined as a benchmarking factor against which changes can be measured.

3.4.2 The Current State Map:

The existing process will be mapped, (based on the findings from 3.4.1 The Initial Analysis), which will indicate the overall usage and acceptance of the existing systems, as well as the time taken to complete each task. Wasted time and efforts within the existing system will be identified as areas for implementing process updates or changes.

3.4.3 The Future State Map:

As discussed in 2.13 – Lean Construction Theory, the process of creating flow has originated from lean manufacturing principals, where the value-creating steps of manufacturing were to occur in tight sequence so the product will flow smoothly toward the customer. Pull will be established through the identification of the needs of the project management teams. The application of creating flow will be applied to the process of capturing and transfer of information and knowledge, between estimating and project management teams. The end goal

is to increase the efficiency of the process, reduce time wasted, improved quality, and reduction of errors.

3.4.4 The Action Plan:

A plan will be developed for the testing of the revised process. Key Performance Indicators will be identified so that the proposed changes quantifiably measured against the existing process. The KPI's will be related to process efficiency (removal of waste), process effectiveness (meeting the needs of the customer, being the project management teams), information and knowledge quality, and process acceptance (how well the end-users understand and accept the revised process).

3.4.5 Experimentation:

The proposed solution will be tested against the pre-determined KPI's benchmarked by the existing process, as evaluated in section 3.4.1 The Initial Analysis and 3.4.2 The Current State Map. The testing methodology will involve the process being reviewed in full, with both estimating and project management teams completing evaluation surveys which will determine whether the process changes have achieved the project aims. Once the testing has been completed, a discussion of the results and observations will be undertaken. Errors will be identified, as will further refinements or improvements to the system which can be incorporated as part of future work. This is in order to commence a continuous improvement cycle to ensure that industry-best practice (perfection) is strived for within the process at all times. As the process has not been implemented at this stage, the results will be presented to the project sponsor for their review. This provides an appreciation for the process and its functions.

3.5 – Safety

3.5.1 Personal Risk Assessment:

The risk assessment accounts for both the personal risk involved in completing the project, and the risks which could affect timely project completion. The template for the risk assessment was modified from Elamb (2015)'s risk assessment template and reflects the level of associated risk, based on the risk probability and consequence matrix (Figure 3.1 below). The actions required indicate the urgency of which the risk must be addressed, with the following:

- *Critical*: Action required immediately
- *High*: Action required within 24 hours
- *Moderate*: Action required this week
- *Low*: Action required this month

Given that the project does not require any laboratory work and is entirely paper-based and theoretical, the risk of personal injury or death overall is considered to be insignificantly low.

		Consequence				
		Insignificant	Minor	Moderate	Major	Catastrophic
Probability		Minor Problem, easily solved	Some disruption possible	Significant time/resources required	Project severly disrupted	Will permanently halt project
Almost Certain	>90%	High	High	Critical	Critical	Critical
Likely	50% - 90%	Moderate	High	High	Critical	Critical
Moderate	10% - 50%	Low	Moderate	High	Critical	Critical
Unlikely	5% - 10%	Low	Low	Moderate	High	Critical
Rare	<5%	Low	Low	Moderate	High	High

Figure 3.1: Personal Risk Probability and Consequence Matrix. Source (Elamb 2015)

Table 3.1: Personal Risk Assessment

HAZARD	RISK	MINIMALISATION
Trip Hazards Hazards	Low	Ensuring that office spaces are kept clear of rubbish and debris at all times
Travel Between Offices – Fatigue	Low	Employment of fatigue management procedures, including stopping regularly for breaks
Eye strain	High	Taking regular breaks away from computer monitor, ensuring task lighting is adequate
Stress	Critical	Employ stress management techniques, adequate rest, scheduled "block out" time for project work

3.5.2 Project Risk Assessment:

The risk likelihood matrix for the project risk (Table 3.2) is divided into very low, low, medium, and high risk.

Table 3.2: Project Risk Assessment

HAZARD	RISK	MINIMALISATION
Permission not granted for use of company systems and Data	Very Low	Ensure permission secured (in writing) prior to commencement.
No permission given to complete surveys during working hours	High	Commit to completing surveys during lunch hours or after hours
Stakeholders unavailable/ unwilling for surveys	Medium	Lock in stakeholders that are willing to assist in continuous improvement prior to commencing project
Resistance to implementing changes to systems and procedures	Medium	Ensuring commitment from stakeholders to objectively review any proposed systems changes prior to commencement
Stakeholders unavailable/ unwilling for surveys	High	Ensure commitment for both "before and after implementation" surveys prior to commencing project work

3.6 – Resource Requirements

A resource analysis has been conducted, with the resources required during the project identified. The resources are generally available at no cost from either the University of Southern Queensland or the project sponsor. Time as a resource has been identified, as during the research a number of estimating and project management team members' time will be required in order to complete interviews and surveys respectively, as well as the review of changes developed through value stream mapping. The sponsor has arranged for this resource to be provided free of charge (Refer Table 3.3 Below).

Table 3.3: Project Resource Requirements

ITEM	AMOUNT	SOURCE	COST
MS Word Software	1 Licence	Student	Nil
A3/A4 Colour Printer	1 Each	Student	Nil
Audio recording equipment	1 Set	Sponsor	Nil
Staff Time	10 Hours	Sponsor	Nil
MS Excel Software	1 Licence Each	Student	Nil
Stationary	1 Set	Student	Nil
Survey Monkey Monthly Subscription	3 months	Student	$75.00 (est)
Travel between offices and sites	TBC	Sponsor	$Nil

Chapter 4 – Methodology Implementation:

Following the review of relevant literature (3.2 – Literature Review Methodology), value stream mapping was followed in accordance with the process outlined in 3.4 – Implementation of Value Stream Mapping for Process Redesign: initial analysis, mapping the current, then future states, the action plan, and experimentation.

4.1 – The Initial Analysis

The initial analysis of the sponsor's handover processes involved the use of staff surveys (Refer 3.3 – Establish Understanding of Existing Systems). In order to understand the handover process, staff were surveyed regarding their use of the of the entire information and knowledge management process for the estimating team.

4.1.1 – Estimating Team Interview: Design and Implementation:

The interview parameters and questions were developed as per the outline provided in section 3.3 – Establish Understanding of Existing Systems. In order to obtain accurate results, given the small survey size, it was desirable to have each estimating team member provide their responses to the interview questions. However due to workload restraints, the estimating team manager would not be available. Additionally, one of the eight estimators was new to the company at the time of the initial interview, and was deemed to have insufficient experience with the sponsor's systems to participate. As such, interviews were undertaken with seven estimators, the estimating assistant, and the pre-contracts manager (nominated by the estimating manager). Prior to being interviewed, each respondent was required to complete and sign the respondent approval form (Refer Appendix C – Consent Form for Participation in Research Project by survey and/or interview/s), which was counter-signed signed by the interviewer.

The interview questions (Refer Appendix D – Initial Estimating Team Interview) that were formulated required an understanding of the sponsor's existing estimating procedures. The interview respondents were required to provide quantifiable responses, such as the amount of time to perform a task, as well as opinion-based short responses. The time to complete the interview was estimated to be approximately 30 minutes per respondent. Some interviews took more than this amount of time, due to the detail of responses provided by members of the estimating team. The interviews were audio-recorded for future note-taking purposes, with the interviewer also making notes on respondent responses.

Respondents were questioned on: Their understanding of documented procedures (and their use of these procedures); The time (or estimated time) required to complete each process; Their opinions on the quality of current document management and information transfer practises; and their recommendations for improvements to existing processes. The results were collated and summarised (refer Appendix F – Summary of Initial Estimating Interview Results). The summarised results are used in the formation of the current and future state maps, as part of the VSM process.

4.1.2 – Project Delivery Team Questionnaire: Design and Implementation:

The Survey parameters and questions were developed as per the outline provided in section 3.3 – Establish Understanding of Existing Systems. The survey was designed and implemented using a proprietary online survey system, which enabled the survey to be distributed to a higher number of potential respondents, and provided summarised responses in a downloadable format (MS Excel Spreadsheet).

When establishing a formula for determining survey sample size, Fluid Surveys Team (2014) state that standard survey should aim for a confidence level of 95% (1.96 confidence score), a distribution of 50% and margin of error of 5%. The following formula are provided for determining true survey size, based on population size (Equations 1 and 2):

Equation 1 – Calculation of Sample Size:

$$Sample\ Size\ =\ \frac{Distribution\ of\ 50\%}{\left(\frac{Margin\ of\ Error}{Confidence\ Level\ Score}\right)^2}$$

Equation 2 – Calculation of true sample (based on sample size):

$$True\ Sample\ =\ \frac{Sample\ Size\ \times\ Population}{Sample\ Size + Population - 1}$$

Therefore, for the 60 potential survey respondents from the project management teams, the calculation is as follows:

$$Sample\ Size\ =\ \frac{0.5}{\left(\frac{0.05}{1.96}\right)^2}\ =\ 768.32$$

And:

$$True\ Sample = \frac{768.32\ \times\ 60}{768.32 + 60 - 1} = 55.72 \approx 56$$

In order to obtain results with 95% confidence with 5% error accurate results, 56 out of 60 respondents would be required to respond to the survey. It was stipulated by the sponsor that the survey was to be completed in the respondent's own time (outside working hours), and that the survey must therefore remain non-mandatory. Of the 60 potential respondents, 15 surveys were initially completed, with a further 7 responses obtained after the survey closing date. Therefore, the revised sample size (at 50% distribution and 95% confidence) was found by the following:

$$\frac{60x}{x + 59} = 23$$

$$23x + 1357 = 60x$$

$$-37x + 1357 = 0$$

$$-37x = -1357$$

$$x = \frac{1357}{37}$$

Where x = Sample size.

Following calculation of the sample size, the margin of error can be calculated:

$$\frac{0.5}{\left(\frac{m}{1.96}\right)^2} = \frac{885}{37}$$

$$\frac{0.5}{\left(\frac{1357}{37}\right)} = \left(\frac{m}{1.96}\right)$$

$$1.96 \times \sqrt{\frac{0.5}{\left(\frac{1357}{37}\right)}} = m = 0.228851$$

The revised margin of error, at 95% confidence, is 22.89%. This represents a decrease from a MOE of 31.25%, based on the original 15 responses received. The survey questions (Refer Appendix E – Initial Project Teams Survey) required an understanding of the information and project knowledge that is typically transferred from the estimating to project management

teams. Respondents were required to answer both short-response, and multiple choice questions, with an option to provide additional comments to their selections The time to complete the survey was estimated to be 10-15 minutes per respondent.

The survey questions related to: The quality of information received; The impact of the quality of information on project commencement; Determining which aspects of the existing ES12 handover procedure are desirable; Opinions what information and project knowledge is vital and whether or not it is commonly provided; How the sponsor's processes compare to industry practice, and any suggestions for improvement. The results were collated and summarised (refer Appendix G – Initial Project Teams Survey Results), and were used in forming the Current and Future State Maps, as part of the VSM process.

4.2 The Current State Map

Forming the current state map involved the use of existing internal procedures, as well as documenting the current state of stakeholder acceptance and understanding of existing processes (Refer 3.3 – Establish Understanding of Existing Systems).

4.2.1 Tender Process Flowchart:

The ESP01 procedural document (Refer Appendix M – ESP01 Tendering Procedure) contains the "Tender Process Flowchart" (refer Figure 4.1 below). The process flowchart provides a visual representation of the current documented estimating process.

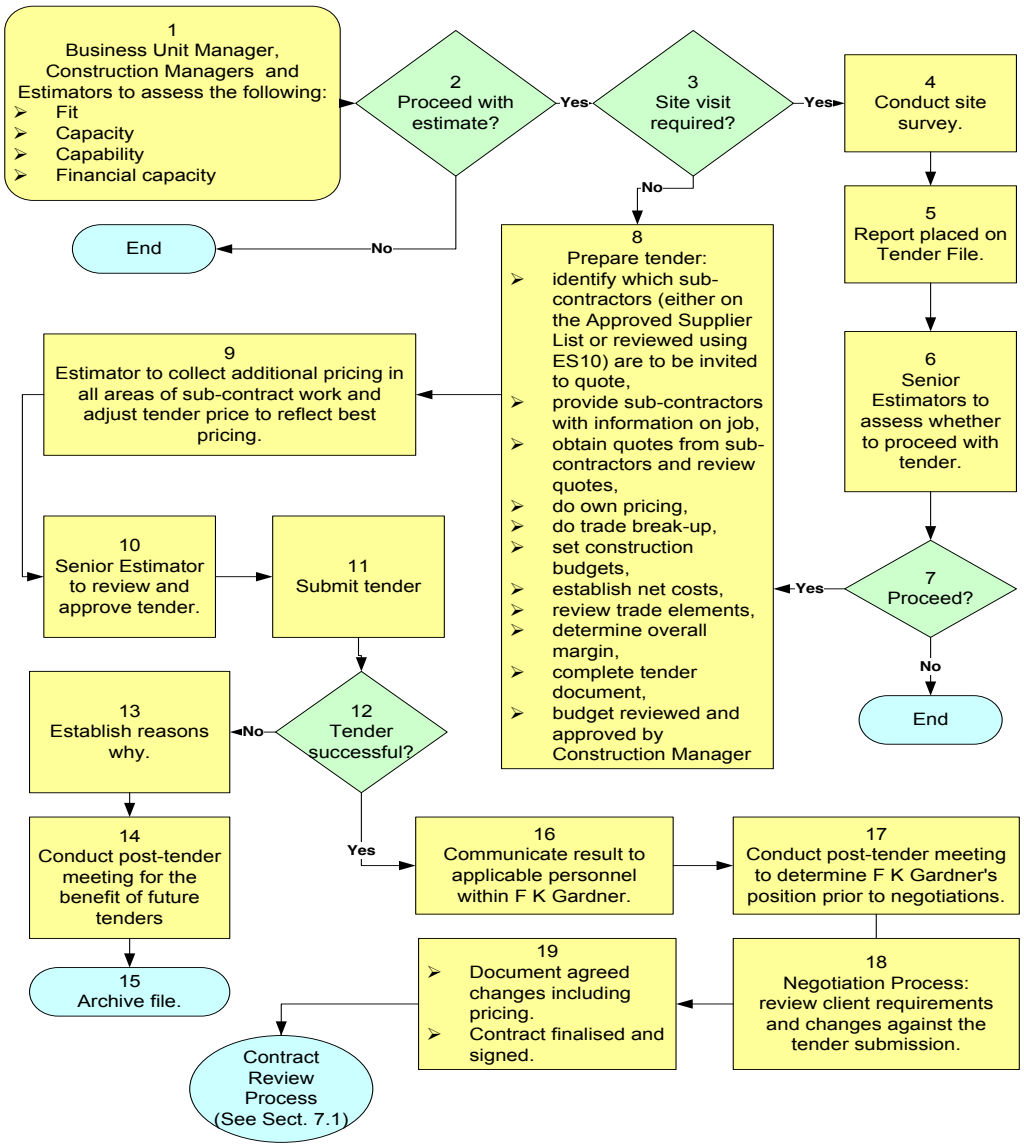

Figure 4.1 Estimating Process Flowchart. Source: FKG (2016)

When asked to demonstrate their understanding of the ESP01, interview respondents indicated a poor general understanding of the procedure, and that the procedure did not demonstrate the current practises of the team. Other procedures and forms were rated using a scale of 1 – 10, with 10 they are very effective and used for every tender, and 0 being "I do not recognise / I have never used this form" (Refer 4.1.1 – Estimating Team Interview: Design and Implementation and Appendix D – Initial Estimating Team Interview). The analysis of the existing (task oriented) process flowchart steps, based on the interview results is as follows:

Step 1:

Interview respondents did not offer any departure from these steps, aside from mentioning that there is a procedural document relating to this step (ES00).

Steps 4, 5, and 6:

Site inspections are often completed, however ES05 form is not frequently completed or filed. The ES05 received an average rating of 5.1. Currently, the estimator will make notes relating to site parameters, conditions, and risks. No formal system is in place for the filing or transmittal of these notes.

Steps 8 and 9:

Generally, processes are followed as listed, with the following departures; The "approved subcontractor's list" does not exist in any current systems; The ES10 form is not completed by the estimator. The form was rated 0.8 (average) by interview respondents.

Steps 10 and 11:

All tender pricing, preliminary allowances, and pricing methodology is compiled and then reviewed by the BUM. The Tender price is then added to the tender submission by the submissions team, along with non-price tender criteria, then submitted.

Steps 13 and 14:

Interview respondents did not offer any departure from to these steps.

Steps 16 to 19:

Interview respondents did not offer any departure from these steps. The ES12 meeting and associated form are completed in this phase of the tender. Following Step 19, the flowchart indicates that the contract review process commences. Interview respondents indicated that the contract review is generally completed prior to an approval to tender is issued.

4.2.2 Receipt and Review of Tender Documents Flowchart:

The ESP01 also contains the "Receipt and Review of Tender Documents Flowchart" (refer Figure 4.2 below). The process flowchart provides a visual representation of the documented process for the management of explicit tender information.

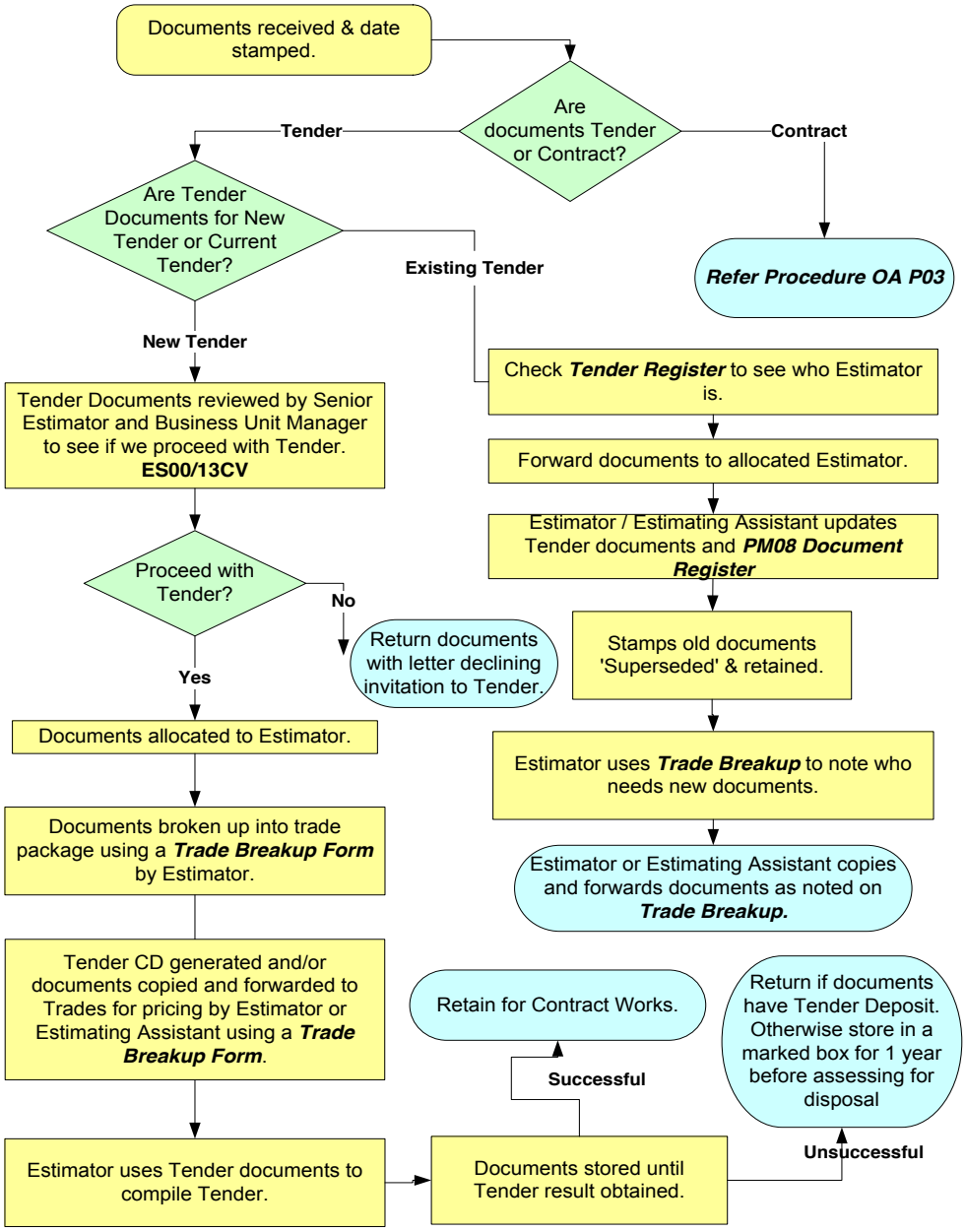

Figure 4.2 Receipt and Review of Tender Documents Flowchart. Source: FKG (2016)

The Receipt and Review of Tender Documents Flowchart refers to the following procedural documents: ES00, ES13CV, Tender Register (ES06), PM08 Document Register, and ES03 Trade Breakup Form. The estimating interview results for each of the forms are as follows:

ES00 Construction Tender Approval Form:

Is completed prior to tender commencement. The form is completed by Business Unit Manager or pre-contracts manager, with the decision to tender being made as a result of information included in the form. The ES00 form received an average rating of 6. The form is not completed by members of the Estimating team, but by the Business Unit Manager (BUM) or pre-contracts manger. The form was rated 9 by the relevant party.

ES13CV - Estimate Process Checklist:

Relates to another division of the the sponsor's organisation. It is semi-related to the ES00 form but not used by the Estimating team. It received an average rating of 0.3.

ES06 Tender Register:

The estimating assistant maintains estimating tender register. Document is protected with limited access. Estimating assistant distributes information from the tender register to relevant parties. It received a rating of 3.75. This is due to its role-specific nature, and that the register has been modified over time and the relevant party is therefore un-aware of the original configuration of the form.

PM08 Document Register:

Interview respondents made no comments regarding the incorporation of this document into the estimating procedure. One respondent noted however, that the management of any document registers is incorporated into the functionality of the EstimateOne platform.

ES03 Trade Breakup Form:

This form has been used previously by the estimating team but is not applicable to current processes as the subcontractor break up distribution are managed through the EstimateOne Portal, which provides a print-out at tender completion of all subcontractor details, documents sent/downloaded etc. The average rating received for the ES03 was 1.8.

4.2.3 Tendering, contractor prequalification and procurement management procedure:

The preamble of the existing ESP01 (Reder Appendix M – ESP01 Tendering Procedure) states that its purpose is to ensure that tendering and estimating processes are conducted in accordance with state and federal ethics in tendering guidelines, to specify the process for requalification and selection of contractors to conduct works, and to cover the procurement of goods and services. It is divided into the following headings: 1.0 Purpose, 2.0 Scope / Exclusions, 3.0 Internal Reference Documents, 4.0 External Reference Documents, 5.0 Definitions, 6.0 Tenders, 7.0 Contract Review, 8.0 Supplier and Subcontractor Prequalification, 9.0 Procurement of goods and services.

4.2.4 Time:

Estimating interview respondents were asked to provide actual times, or estimated times to follow each procedure that is detailed in the ESP01 document. The total estimated time to complete all processes relating to tendering was 17.9 hours. The average estimated time spent following the ES12 procedure (including sourcing information for the ES12 form), was 3.2 hours. Project Managers estimated that the tender handover meeting takes 1 – 2 hours, and

suggested that this amount of time can be insufficient to facilitate the transfer of all required project knowledge. The revised handover procedure will aim to increase efficiency, through reduced information re-entry, and streamlined processes to enable time to be invested in the tender handover.

4.3 The Future State Map

As demonstrated in 4.2 The Current State Map (and Appendix F – Summary of Initial Estimating Interview Results), the existing processes in place for the management of information and project knowledge are not strictly adhered to. As outlined in 3.3 – Establish Understanding of Existing Systems, it was determined that in order to successfully implement changes to existing processes, key stakeholders (estimating and project management team members) must be involved.

4.3.1 Establishing Push and Pull:

As outlined in 3.4.4 The Action Plan, in order to establish pull, the requirements of the end-user must be determined. As the end-users of the transferred information are the project teams, the survey respondents were asked to provide an overall rating and some detail as to the quality and quantity of information that is usually transferred to them by the estimating team (Refer Appendix E – Initial Project Teams Survey, Questions 1, 2, and 6). All respondents rated the quality and presentation of the information as either "Excellent", "Good", or "Acceptable". When asked to elaborate on their chosen rating, respondents noted that the sponsor's current handover process (involving the ES12 procedure) is reasonably thorough, however the quality of the transfer of information is directly related to which members of the estimating team were involved in the tender (the quality of information and knowledge recorded in the ES12 is equal to the quality of transferred information and knowledge). Additionally, it was noted that due to time constraints placed on the estimating team (and the continual flow of tenders which require pricing), the handover process is often rushed, with the estimating team not providing a detailed methodology of how the project was priced, and spending very little time reviewing possible risks and opportunities with the project delivery team. Question 7 asked respondents if they believed any information is transferred between teams that is not required. The collective response to this was that as much information as possible should be provided. When asked what impact quality of information transferred from the estimating team has on successful project commencement, the majority of respondents selected the response; "Considerable Impact". The project can commence without all of the information from the estimating team,

but it greatly increases the risk of error and potential loss of margin" (Refer Appendix E – Initial Project Teams Survey, Question 3).

Both the interview and survey respondents were asked to list what in their opinion, was the most vital types of information and knowledge to be transferred between teams at tender handover. Figure 4.3 (below) provides a summary of mutually agreed items (Refer Appendix F – Summary of Initial Estimating Interview Results and Appendix G – Initial Project Teams Survey Results for full list). It also shows which items that were exclusively nominated by either the estimating or project management teams:

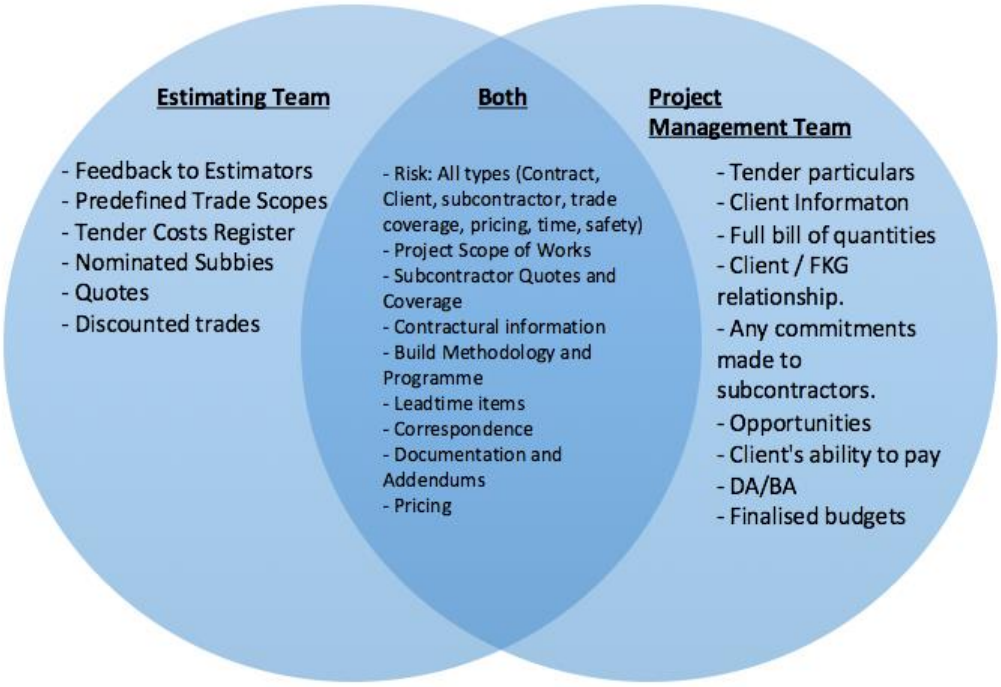

Figure 4.3 The Information Required for the transition between Estimating and Construction teams, according to interview and survey respondents. Source (Appendices FandG).

The "ES12 Tender, Contract and Opportunity Review" meeting is the main opportunity for the transfer of information and tacit project knowledge between teams. The ES12 form is currently used by the Estimating team as a guideline of what information and knowledge is to be transferred to the project management team. Survey respondents were presented with the ES12 form, and asked to highlight all of the project information elements that they believed to be to the project team, at project commencement. This enabled each information element to be ranked by its importance to project teams (Refer Appendix G – Initial Project Teams Survey Results – Question 4). The highest ranking item, having been selected by 100% of respondents, is the project scope of works.

4.3.2 Existing Procedures and Forms:

Each of the existing procedures (and associated forms) have been assessed based on information captured, current usage, and possible incorporation into the revised process, as follows:

ESP01 – Tendering, Contractor Prequalification, and Procurement Management Procedure:

This is to be updated to reflect new and existing practices. References to subcontractor prequalification and procurement to be removed. Process flowcharts to be updated. Engagement of consultants (section 6.4 ESP01) to be removed and placed under pre-contracts management. Contract review to be updated to reflect current practices. Name of procedure to be updated to reflect the removal of subcontractor prequalification and procurement management

ES00 - Construction Tender Approval:

Nil Change required. Form is not completed by estimating team, but is to be included in revised ESP01 for transfer to project team.

ES01 - Quotation Request, ES02 - Quotation Request - Addendum No, and ES03 - Trade Break Up Form:

Forms no longer applicable. To be removed from procedure. ESP01 to be updated to reflect change and current use of EstimateOne platform.

ES05 – Site Visit Report:

To be reviewed to ensure information required on-site inspections is in line with current expectations from project teams. Revised form to be incorporated into Project Knowledge File.

ES06 – Tender Register:

Nil change required. Tender register to remain separate from project knowledge file as it is maintained by the Estimating Assistant.

ES07 – Tender Meeting Minutes:

Nil change to process required, however process is to be incorporated into revised ESP01 to ensure that all information is captured from internal and external tender or project meetings.

ES08 – Legal Review and ES09 Tender Review – Legal:

Forms and procedures no longer applicable. ESP01 to be updated to include legal review as part of initial tender start-up within the PKF, with full legal review to occur if/when triggered by contractual conditions that depart from standard acceptance.

ES10 – Subcontractor Prequalification Questionnaire and ES11 – National Code Compliance Subcontractor Prequalification Questionnaire:

Forms and procedures not applicable to estimating process. To be removed.

ES12 - Tender, Contract and Opportunity Review:

Form to be reviewed against stakeholder demands and information and knowledge capture and transfer literature. Will form the basis of the Project Knowledge File, which will be maintained by the estimator for the tender period.

ES13CV – Estimate Process Checklist:

Forms not applicable to Construction division's estimating process. To be removed.

4.3.4 Implementation of a Live Knowledge Capture model and IWS:

The relevant literature (refer sections 2.4 – Knowledge Management Classifications, 2.7 – Knowledge Capture and Re-Use Strateg, and 2.9 – Communication in Knowledge Management systems) outlines the nature of tacit knowledge being difficult to express or document. Specifically, when relating to estimating and project management, tacit knowledge can include (but is not limited to), the understanding of the methodologies behind the decisions that have been made with regards to the project pricing, timeframes, and building sequence etc. Formal transfer of tacit knowledge is difficult to document, manage, or facilitate, as it most effectively occurs through face-to-face communication channels, established by mutual trust between teams who are striving for the same goal.

In order to facilitate this face-to-face exchange of knowledge between teams, as much project knowledge must be gathered over the tender period, and presented in a manner which is easily disseminated project management team. The current Estimating Process Flowchart shows the current practice of completing the ES12 form after a tender is successfully converted. The Code of Estimating Practice (1994) states that the handover meeting is held soon after a project is awarded, but ideally before the contract has been signed. Given that tenders may not be awarded for several weeks' post-completion, it is unreasonable to expect that the estimator will recall every decision made with regards to the pricing, risk, subcontractors etc. As such, it is proposed that a live knowledge capture and re-use strategy (detailed in 2.7 – Knowledge Capture and Re-Use Strateg), is implemented.

Live project knowledge capture is based around a single project knowledge manager (the estimator), who identifies reusable project knowledge through a series of learning events over the tender period. This knowledge is stored in a central project knowledge file, through an integrated workflow system.

The literature (section 2.7 – Knowledge Capture and Re-Use Strateg) defines reusable project knowledge as knowledge which could foreseeably be used later in the project (or on another project), to mitigate loss and/or maximise efficiency, both of which have a financial benefit to the project. The Purpose of the integrated workflow solution is to facilitate the capture of the project knowledge.

The estimating interview respondents indicated that existing procedures are not always followed, due in part to time constraints placed on the team by continual workflow. As such, it was determined that the IWS must be complimentary to the work being completed, and recording of learning events into the PFK must not be a time-consuming process. The nominated learning events for collecting project knowledge are taken from the recommendations of the interview and survey respondents, and the literature (section 2.10 – Handover between Estimating and Project Management Teams). They are as summarised in Table 4.1 below.

The IWS (known as the Tender Knowledge Register), is incorporated into the PKF (or tender folder), through the revised estimating processes. The estimator will be required to follow the steps of the revised Estimating Process Flowchart included in the revised ESP01 procedure, which details the procedures to be followed in order to capture the project knowledge associated with the tender phase events (Refer Table 4.1).

Table 4.1 Summary of information stored in the Project Knowledge File, gathered through the integrated workflow solution, and managed by the project knowledge manager.

PKF/IWS SECTION	TENDER PHASE	DETAILED INFORMATION PROVIDED
1. Project Start-up **New*	Tender Particulars	Project name, reference number, tender due date, submission information, client and superintendent information, competition, provisional sums and consultants fees
	Project Particulars	Commencement date, site address, site visit requirements, approvals status.
	Submission Particulars	Programme information, nominated subcontractors, pricing schedule details.
2. Estimator's Contract Review **Replaces ES08 and ES09*	Contract Review	Brief contractual review of nominated conditions compared to the sponsor's preferential conditions. *Note, full review may also be completed*
3. Site Visit Report **Replaces ES05*	Site Visit	General Site information; council services; notes on site condition, topography and existing structures; demolition requirements; site access; ground conditions observed; local services and utilities; security; local subcontractors
4. RFI's and Addenda **New*	RFI's and Addenda	RFI and Addendum Registers

5. Trade Pricing **New*	Trades	Key Trade Information including: Trade name, selected subcontractor, trade risks (site), pricing risk, comments on scope and trade generally
	Preliminaries	Summary of key project preliminary (overheads) inclusions
6. Submissions **New*	Cover Letter	Methodology (scope of works) and Covering letter clarifications/qualifications
7. Post-Tender **Replaces ES12*	Post-tender Negotiations	Summary of changes to: Project particulars (e.g. Start-date), contract conditions, tender clarifications and responses, pricing, and documentation
8. Tender Handover **New incorporates ES07*	Handover compilation	BOQ's, tender submission, hard copy documentation, quotes. Copy of subcontractor send-out list (exported from EstimateOne) - NOTE: Saved as a separate file. Copy of full document register Meeting Agenda and Minutes

4.4 The Action Plan

4.4.1 IWS Design – The Tender Knowledge Register:

The tender knowledge register (TKR) has been designed as a replacement for the existing estimating forms. In addition, the TKR mitigates the need for estimators to utilise uncontrolled checklists or file additional notes, which can easily be misplaced. It is formatted as an Microsoft Excel spreadsheet (Refer Appendix L – Tender Knowledge Register). The use of an Excel spreadsheet ensures that the PKF can be incorporated into the sponsor's existing QA system, and mitigates software compatibility or cost implications during implementation. It also permits review and reporting of results for this research project.

Each spreadsheet tab (section) relates to a tender phase, with associated project information and knowledge is being recorded as it is discovered or learned by the project knowledge manager. Table 4.1 (above) details the TKR sections, relevant knowledge and information collected, and the relationship with the existing processes. TKR sections are formatted with a similar design aesthetic to the existing forms, to maintain a level of familiarity for project stakeholders. Tabs will be linked to ensure that information is not needlessly re-entered.

4.4.2 ESP01 - Tendering Procedure:

The ESP01 document has been revised from the "Tendering, contractor prequalification and procurement management procedure" to the "Tendering Procedure". (Refer Appendix M – ESP01 Tendering Procedure). The removal of contractor and procurement management guidelines was in line with interview results (Refer Appendix F – Summary of Initial Estimating Interview Results). The results indicated that Estimating team members are not generally involved in procurement or subcontractor prequalification directly, as they price the project scope using quotes, regardless of whether the subcontractor has worked with the

sponsor previously. Additionally, new subcontractors are less inclined to undergo prequalification questionnaires without securing the project (which cannot be guaranteed at tender time). The revised estimating procedure both brings the current practises (such as the use of EstimateOne) into the documented procedures, and incorporates the extensive use of the Tender Knowledge Register, by estimators and others.

4.4.3 Estimating Process and Receipt and Review of Tender Documents Flow Chart:

The revised flowchart is included within the revised ESP01 procedure (Appendix M – ESP01 Tendering Procedure). It reflects the process changes (including the implementation of the PKF) and has been updated to reflect current practises in other areas.

4.5 Experimentation

4.5.1 Testing Methodology:

The proposed changes will be tested by a review from the intended end-users. The review will involve the respective teams being provided the ESP01 and Tender Knowledge Register, then being asked to complete a survey to determine their opinions on the level of improvement over the existing processes and procedures. The survey will be based around the pre-determined KPI's of efficiency of knowledge capture and transfer, and the quality of knowledge and information being provided to the project management teams.

4.5.2 Final Estimating Survey:

The final estimating survey (refer Appendix H – Final Estimating Survey) was distributed, along with the ESP01 and TKR, to the members of the estimating team who were interviewed regarding the effectiveness of the existing system. This was to ensure the maximum response rate, given the team member's prior knowledge of the research project and its aims. An online survey was chosen as the preferred medium to capture responses, as it allowed respondents to provide ratings (generally from 0-10 in whole number increments), which provided quantitative data to compare with the results from the initial estimating team interview. The questions relate to the quality and flow of the processes outlined in the ESP01, the effectiveness of the knowledge capture in the TKR, the time required to complete the estimating processes outlined in the ESP01, and whether or not the respondent considered the revised processes an improvement or not.

From the original 9 interview respondents, 8 responded to the final survey, with one Estimator unable to respond due to commitments relating to a current project close-out. By using the

equations provided in 4.1.2 – Project Delivery Team Questionnaire: Design and Implementation, the margin of error for this response is as follows:

$$\frac{9x}{x+8} = 8$$

$$8x + 64 = 9x$$

$$x = 64$$

Where x = Sample size.

Following calculation of the sample size, the margin of error can be calculated:

$$1.96 \times \sqrt{\frac{0.5}{64}} = m = 0.17324$$

Therefore, the margin of error is 17.32%

4.5.3 Final Project Teams Survey:

The final project teams survey (refer Appendix I – Final Project Teams Survey) will be distributed, along with the TKR, to the members of the project management teams who responded to the initial project teams survey. As with the final estimating survey, this distribution will ensure the maximum response rate, given the team member's prior knowledge of the research project and its aims. Again, an online survey was chosen as the preferred medium to capture responses, as it allowed respondents to provide ratings, which provide quantitative data to compare with the results from the initial project teams survey. The questions relate to the importance of the information and knowledge captured in the TKR, the presentation and flow of the information and knowledge within the TKR, and a comparison of the revised processes with the existing processes in place.

From the original 23 initial project teams survey, 19 responses were received for the revised survey. By using the equations provided in 4.1.2 – Project Delivery Team Questionnaire: Design and Implementation, the margin of error for this response is as follows:

$$\frac{23x}{x+22} = 19$$

$$19x + 418 = 23x$$

$$x = 104.5$$

Where x = Sample size.

Following calculation of the sample size, the margin of error can be calculated:

$$1.96 \times \sqrt{\frac{0.5}{104.5}} = m = 0.13557$$

Therefore, the margin of error is 13.56%.

Chapter 5 – Results:

5.1 Estimating Team Results

The complete responses received for the final estimating and project team surveys regarding the revised estimating processes and Tender Knowledge Register are located in Appendix J – Final Estimating Survey Results and Appendix K – Final Project Teams Survey Results. A summary of results is provided below.

5.1.1 Revised System Relevance:

Estimators were asked to review the Estimating Process Flowchart, located in the Revised ESP01 Tendering Procedure, and provide a rating from 0 - 10 as to whether the processes follow a logical sequence for the management of a tender, with 0 being "These are completely irrelevant to a tendering process", and 10 being "Yes – the flow is logical and would allow efficient and effective tendering". The average rating received was 7.625/10, or 76.25%.

When asked to provide comment justifying their ratings, the estimating team members provided comments that it was a better representation of current processes, e.g. “Flow chart is more accurate and reflects what the estimating team do during tender process”. However, it was also noted by some that the perceived workload had increased, and that the process, while potentially beneficial, could detract from the task of pricing and completing the tender, which is the end-goal of the estimating team. It was also noted that the existing process flowchart (upon which the revised flowchart was based), is currently being revised, with the revised flowchart to include several similar steps and processes. This review is not yet complete.

When asked to rate the TKR sections using a scale of 0-10, with 10 being “they appear to be very effective and I would welcome their incorporation into THE SPONSOR’s systems”, and 0 being “I do not recognise a need for this form”, the ratings in Figure 5.1 were provided by estimating team members. These have been plotted against the ratings provided in the initial estimating team interview for the relevant processes that have been replaced by the TKR. As the TKR incorporates several new sections, it is not possible to directly relate every section. The average rating provided (overall) for the potential effectiveness of the TKR sections was 7.11, or 71.1%. the Average rating provided for the relevance of existing processes (as a whole) was 3.11 or 31.1%.

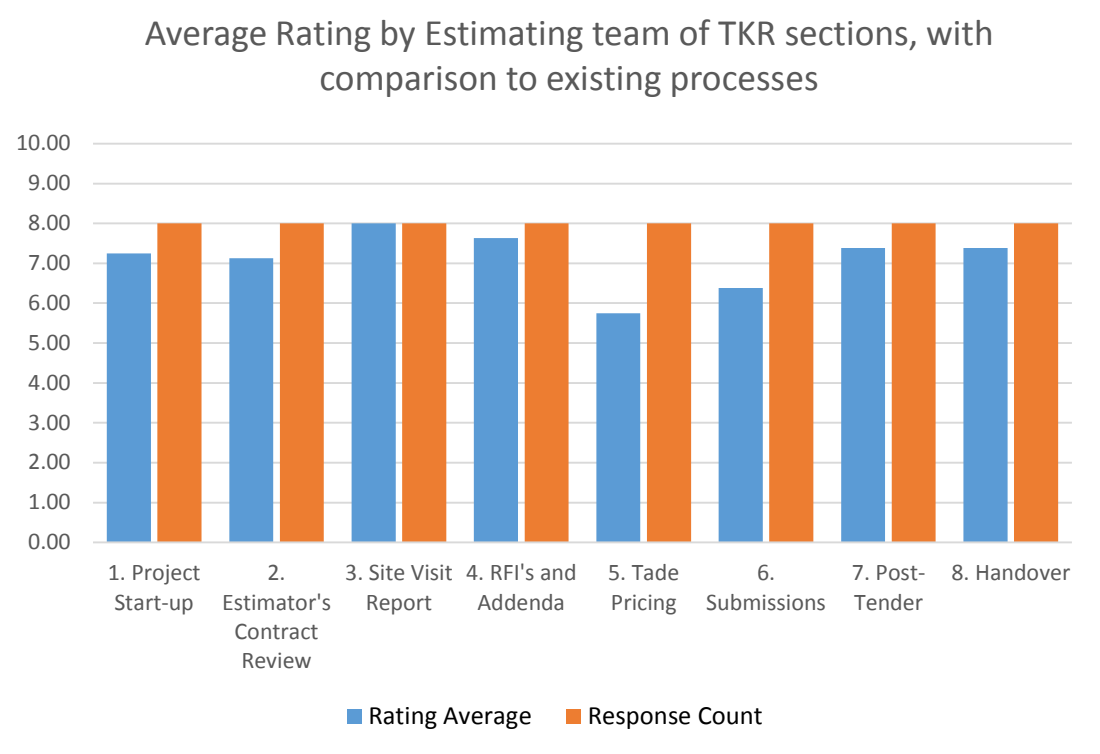

Figure 5.1 Average Rating by Estimating team of TKR sections, with comparison to existing processes

When asked to provide comment justifying their ratings, the estimating team members provided comments relating to each section. A summary of comments is included in Table 5.1:

Table 5.1: Summary of Estimating Team comments relating to TKR sections

TKR SECTION	SUMMARY OF RESPONSES
1. Project Start-up	• Captures relevant information • Information is already captured in ES00 • Estimating assistant/others can/do capture this into • Potentially add consultants for DandC projects
2. Estimator's Contract Review	• Contracts generally always reviewed by others • Good for estimator to know, but they could read contract review (if done) • Comprehensive list of relevant contract items. Easily identifies which items need further review by Commercial Manager
3. Site Visit Report	• Generally positive comments • Some prefer note-taking or to have others visit site • Very important
4. RFI's and Addenda	• Generally positive comments • Should be completed by Estimating Assistant • would be good if it generated the email or information which would then be copied and pasted into an email.
5. Trade Pricing	• Potentially time consuming • All trades must be reviewed, not top 10 • Comparison in Buildsoft already • a general register where the estimator identifies key risk trades and provides a brief description would suffice.

	• Proposed format appears complicated. • There is benefit in it but time is a key factor here to get it reviewed and factored in time.
6. Submissions	• Potentially time consuming to update – however good to progressively provide information to submissions team, rather than a large dump prior to tender submission. • Good to collate in info one spot • MS Excel format could create issues in transferring to MS word or email
7. Post-Tender	• Looks useful but would require input from others also • May be time consuming to complete for estimator • Useful to track post tender developments in a central location. • Potential to prevent miscommunication or misplaced information • Good that form captures and summarises agreed contract and scope changes in one place.
8. Handover	• Similar to existing ES12 • Gives generalised topics for discussion and much more succinct and relevant that existing handover form

5.1.2 Revised System Efficiency:

Each respondent was asked to provide an indicative estimate of the time required to complete each section of the TKR (Refer Table 5.2). This was to be directly compared with the time required to complete each section of the existing processes associated with the existing ESP01 Note ESP00 and ES06 Tender Register have been excluded from comparison, as they are completed separately to the section / form completed by the individual estimator.

Table 5.2: Estimated time to complete TKR Sections (refer Appendix J - Final Estimating Survey Results)

TKR SECTION	RESPONSE AVERAGE (HOURS)
1. Project Start-up	0.75
2. Estimator's Contract Review	1.38
3. Site Visit Report	0.88
4. RFI's and Addenda	1.88
5. Trade Pricing (assume 10 key trades identified)	3.00
6. Submissions	1.75
7. Post-Tender	2.63
8. Handover	1.50
Total	**13.77**

Table 5.3: Estimated time to complete existing processes and associated forms (refer Appendix F – Summary of Initial Estimating Interview Results)

EXISTING PROCESS / FORM	RESPONSE AVERAGE (HOURS)
ES00 - Construction Tender Approval	EXCL
ES01 - Quotation Request	0.6
ES02 - Quotation Request - Addendum No.	0.4
ES03 - Trade Break Up Form	3.3
ES05 - Site Visit Report	2.2
ES06 - Tender Register	EXCL
ES07 - Estimating Meeting Minutes	0.6
ES09 – Tender Review Legal	2.3
ES12 - Tender, Contract and Opportunity Review	3.2

ES08 – Legal Review	1.9
ES10 – Subcontractor Prequalification Questionnaire	0.25
ES11 – National Code Compliance Subcontractor Prequalification Questionnaire	0.25
Total	**13.0**

5.1.3 Revised System Overall Comparison:

Estimating respondents were asked to compare the revised system to existing processes, and provide a rating out of 10, with 0 being "Not improved at all – I don't recognise any significant improvement whatsoever", and 10 being "Significantly Improved - These changes should be implemented ASAP". The average results are shown in Figure 5.2. Respondents were also asked for further comment, however most did not respond. Two responses were "People are reluctant for change" and "Having all of the sections/topics in one combined form is good rather than lots of separate forms. This will mean that the form will be more likely to be completed in an ongoing way throughout the tender and post tender process". The overall average rating of the revised TKR is 5.94 or 59.4%.

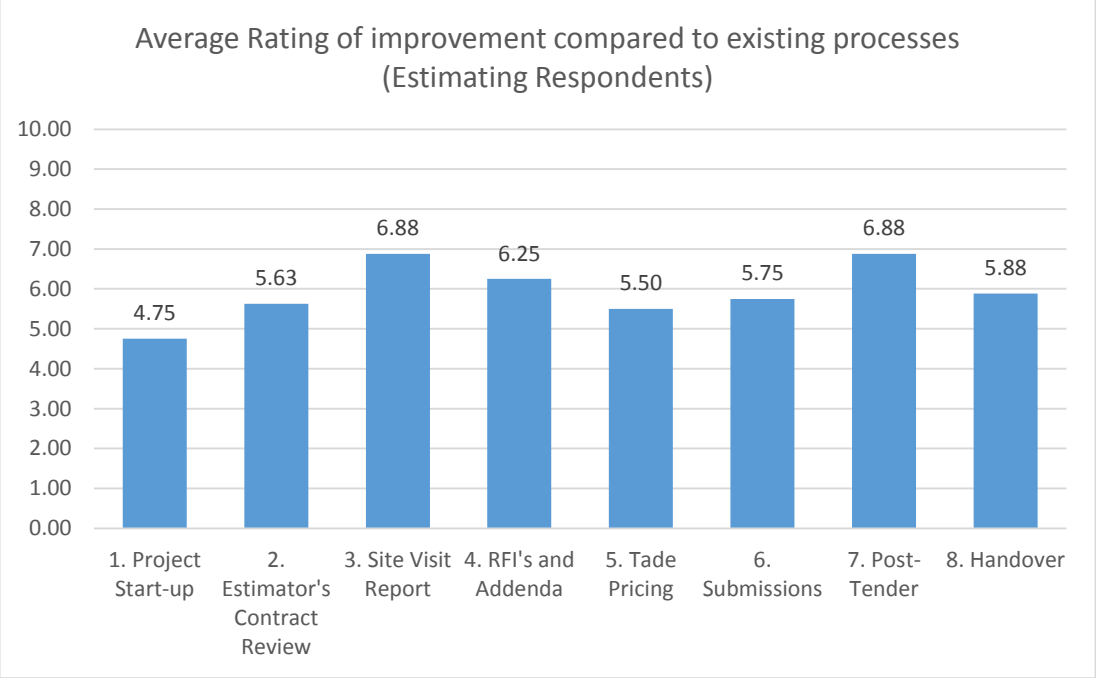

Figure 5.2: Average Rating of improvement (from 0 - 10) received by Estimating team, per section of Tender Knowledge Register (Compared to existing processes). (refer Appendix J - Final Estimating Survey Results)

5.2 Project Team Results

5.2.1 Revised System Relevance:

Project team survey respondents were asked to rate the importance of the information in each section of the TKR out of 10, with 10 being "this is absolutely vital" and 0 being "this information is not required by the project management team at project commencement". The average ratings are provided in Figure 5.3 below. When asked to provide comment justifying their ratings, the project team respondents provided comments relating to each section. A summary of comments is included in Table 5.4. When asked to rate the impact of information quality on project commencement and success, a combined 95.4% of initial survey respondents rated the impact as either "Considerable Impact", meaning that the project can commence without all of the information from the estimating team, but it greatly increases the risk of error and potential loss of margin; or "Huge Impact", that without the correct information, the project will suffer (refer Appendix G – Initial Project Teams Survey Results).

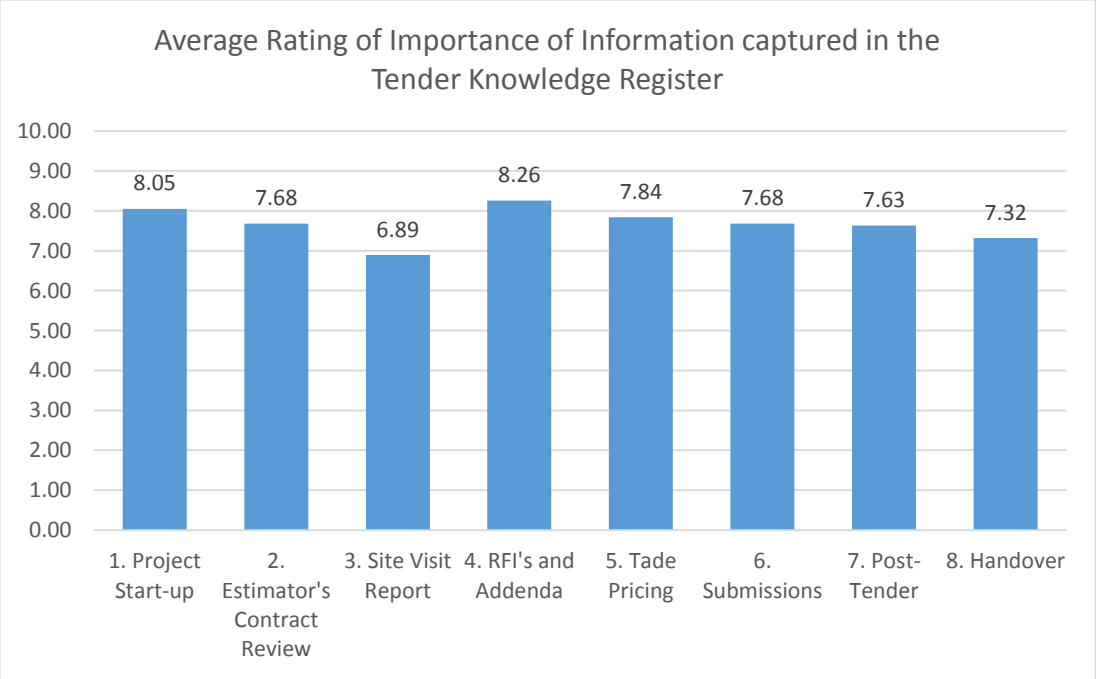

Figure 5.3: Average Rating of importance (from 0 - 10) received from Project Teams, per section of Tender Knowledge Register. Refer Appendix K – Final Project Teams Survey Results.

Table 5.4: Summary of Project Teams comments relating to TKR sections. Refer Appendix K – Final Project Teams Survey Results.

TKR SECTION	SUMMARY OF RESPONSES
1. Project Start-up	• Important for estimating; redundant for project • Should be "tender start-up"

	• Critical that client and superintendent contact details are known at commencement. • Risks and opportunities could be here also • Similar to existing forms (multiple)
2. Estimator's Contract Review	• Could be useful to be re-filled at project start-up for comparison • Important information, but not critical to commencement • Project teams will need to undertake own review regardless • Some format change suggestions
3. Site Visit Report	• Pending the type of project - Greenfield site inspection by the estimator is less important than for a refurbishment. • Project team will look at it but will generally do their own. • Very important if the job is not easily accessible to project team, otherwise preference is to actual visit site in person. • Similar to existing ES05 • Add reference to available soil report, geotechnical investigations, nature of foundations for adjacent buildings etc.
4. RFI's and Addenda	• Most tender doc sets are not updated and Addenda form a critical base for the hand-over. • Helpful to see if tender queries responded to/what changes were made • This information is important however not vital to enable commencement. • Generally, the most important thing is that the estimator can verify that the contract is based on the answers to the RFIs and that the for construction drawings have been updated to encompass the responses during the tender period. Loose ends are important to know about.
5. Trade Pricing	• Good but Preliminaries should be expanded. • May provide assistance when reviewing quotations and then putting the project out for contact and help to review project price risks. • Important for early trades on site • Some double up from BOQ also provided (e.g. preliminaries) • Good to know where risky pricing has been used. • Another form of risk identification could be the bill of quantities - guaranteed by the client, determined by THE SPONSOR, or S/C lump sum tender pricing.
6. Submissions	• Good to have, but not necessary • Critical that tendered methodology is understood prior to planning and commencing works. • We need to know what our company has offered up to get the project “over the line”
7. Post-Tender	• This is the biggest noncompliance area currently within this organisation as the estimator is in most cases not involved in all negotiations. • The negotiations post tender are very important as this is where we have to compromise to win a job and all previous submissions are overridden. • Similar to existing ES12
8. Handover	• Should all the above be 100% complete project team should be able to proceed without a detailed handover • Similar to existing process • Of least importance to project commencement. • Every piece of information is essential in building a platform for the site team and giving them the best chance at success. • Provides summary of other sections

	• It's very important that this process is not rushed and that it is thorough, so as to give the project team a great start.

5.2.2 Revised System Presentation of Information and Knowledge:

Project team respondents were asked to provide a rating out of 10 relating to the presentation of tender information and estimating knowledge in the Tender Knowledge Register, with 10 being "The information follows a very logical sequence, allowing PM's and CA's to grasp a good understanding of the project", and 0 being "The information is hard to digest and would be impossible for the project team to negotiate". The average rating for each section is shown in Figure 5.4 below. Comments relating to rating provided were requested, however were generally not provided. Some suggested formatting changes etc. were suggested (Refer Question 2, part 2 - Appendix K – Final Project Teams Survey Results). When asked to rate the presentation and quality of information currently received from the estimating team, the majority of initial project team survey respondents selected “Good. We receive the information that we need, though it could be better packaged or organised for us, and/or there might be some missing info” (refer Appendix G – Initial Project Teams Survey Results).

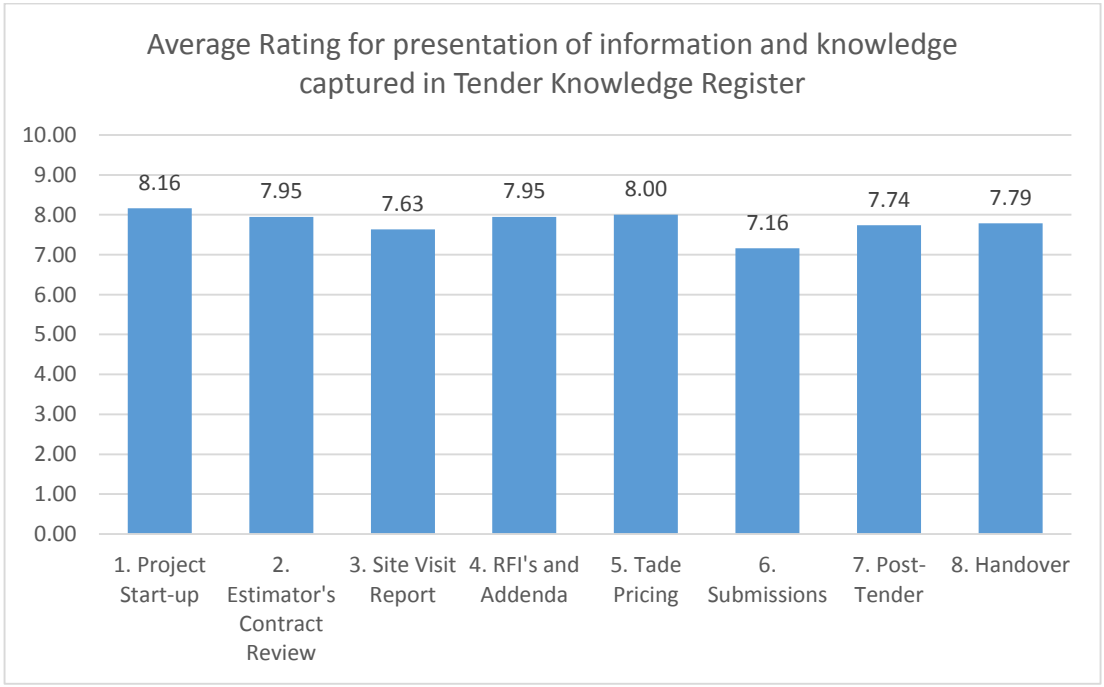

Figure 5.4: Average Rating for logical flow of information and knowledge captured in TKR. Refer Appendix K – Final Project Teams Survey Results.

5.1.3 Revised System Overall Comparison:

Project team respondents were asked to compare the outputs from the with the information they have received from the Estimating team on previous projects, and provide a rating out of 10,

with 10 being "This is a significant improvement, and should be implemented ASAP", and 0 being "This is not an improvement at all/I cannot see any advantage in this system". The average rating for each section is provided in Figure 5.5. The overall average improvement score for the revised system is 6.47 or 64.7%. When asked to provide comment justifying their ratings, the project team respondents provided comments relating to each section. A summary of comments is included in Table 5.5 below.

Table 5.5: Summary of Project Teams comments relating to knowledge presented in TKR. Refer Appendix K – Final Project Teams Survey Results.

TKR SECTION	SUMMARY OF RESPONSES
1. Project Start-up	• Info provided not particularly new, but concise and well formatted. • Similar to what estimators already should handover
2. Estimator's Contract Review	• I do not believe the estimators do any formal written review at tender phase.
3. Site Visit Report	• Could be useful as there are often emails sent but nothing formally recorded. • nothing received previously, just a discussion
4. RFI's and Addenda	• Summarised well
5. Trade Pricing	• Would be interesting to see if estimators complete this and how it compares to what is input into Buildsoft and comparing it to quotations provided. • will estimators actually take the time to complete this or just hand over hard copies of quotes and emails and by pass filling this out.
6. Submissions	• Nil comment
7. Post-Tender	• Would be a big improvement and help to be informed on post tender discussions.
8. Handover	• This is a duplication of over existing forms that provide more relevant information for the project team. • However, I believe form will assist the estimator formatting his handover.

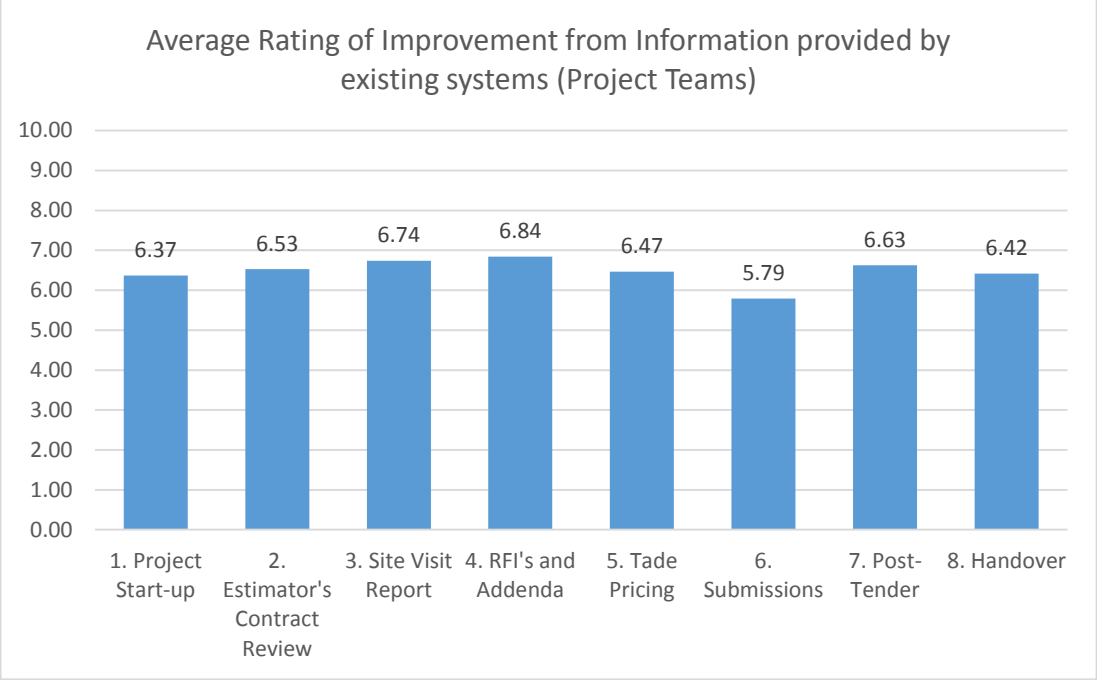

Figure 5.5: Average Rating of Improvement from Information provided by existing systems (Project Teams). Refer Appendix K – Final Project Teams Survey Results.

5.3 Discussion of Project Findings

The feedback received from both the estimating and project teams regarding the proposed process changes was generally positive, with team members appearing open to the changes of the proposed system, and willing to provide further feedback in order to ensure that if implemented, it would meet the needs of both teams.

The initial estimating survey was used to determine the acceptance and use of the existing processes, and which information and knowledge was considered important to transfer to project teams. It also aimed to identify estimating stakeholder nominated process improvements. The 9 responses received represented a majority of the members of the estimating team. The respondents indicated that the existing documented processes and associated forms are generally not followed, as they are no longer relevant to current practises within the estimating department. The most commonly recurring requirement was the need to discuss and document project risk, and ensure that the project team has an understanding of the mitigation efforts incorporated into the tender pricing to combat said risks.

Likewise, the initial project teams survey was used to determine the information and project knowledge required by project teams, the importance of that knowledge, and the quality of information and knowledge currently transferred to the project teams at project

commencement. 23 responses out of 60 potential respondents were received, representing a 22.89% margin of error, at 95% confidence. The respondents indicated that generally, they received the information that was required, in a format that was easy to digest. It was however noted that the quality of information and project knowledge gathered, and therefore transferred to the project teams was dependant on which member of the estimating team prepared the tender, rather than the system or procedure that was followed. Respondents were presented with 77 separate items of project information or knowledge currently incorporated into the existing ES12 handover document. They were asked to identify the important information required at project commencement. The top five items were (in chronological order): Scope of Work, Financial Opportunities within the tender, Latent Conditions, build methodology and program, and what assumptions has the estimating team made. Additionally, respondents commented on the need to have a full understanding of, changes that have occurred both during and post-tender to documentation and pricing, negotiations between client and the sponsor; and contractual risks

The results from both the initial estimating interview, and the initial project team surveys were incorporated into the knowledge and information capture processes in the tender knowledge register. The proposed tendering knowledge register (integrated workflow solution) was then tested though the use of final estimating and project team surveys. The TKR/IWS was designed in conjunction with the tender process flowchart and represents logical process for the management of tender information and knowledge capture and transfer.

The final estimating survey had responses from 8 out of the 9 invited respondents. Based on a 95% confidence level, this results in a margin of error of 17.32%. The final project teams survey had responses from 19 out of 23 invited respondents. This results in a margin of error of 13.56%, representing a reduction of 9.33% from the initial survey (22.89% margin of error), due to the smaller sample size.

The estimating team considered the revised processes to be more relevant to their current practises than the existing processes. This is evident in the increased overall rating from 31.1% to 71.1%. The TKR sections that directly relate to the existing processes all showed an increase in effectiveness rating, with the Estimator's contract review demonstrating the largest increase. It can be seen that even considering that most tenders require an external contract review, the members of the estimating team consider it important to ensure that the estimator has a good understanding of the contract and associated contract conditions.

The estimated time required to complete the existing and proposed processes is broadly similar, with the existing process taking an estimated 13 hours, and the revised taking an estimated 13.77 hours. The slight increase in estimated time has not dramatically effected the overall ratings of the system, with all TKR sections being rated over 5/10 for improvement, with the exception of the project start-up section (Rated 4.75/10). The average rating was 5.94 or 59.4%.

The project teams rated the TKR slightly higher overall than the estimating team, with an average rating of 6.47/10 or 64.7% (Refer Figure 5.5). In 3.4.3 The Future State Map it was identified that pull would be used to determine the requirements of the system. It is proposed that the higher rating provided by the project teams is due to the system being tailored to suit their required knowledge and information. Several final estimating survey respondents made comment on the perceived time required to complete relevant sections of the TKR, which were rated as highly important by the project team respondents. Figure 5.3 shows that the project teams consider the information which has been included in the TKR as very important. In comments received (Refer Table 5.4), there were suggestions as to more information which could be incorporated into each section. Figure 5.4 shows the average rating received for each section of the TKR by the project team respondents. The overall average rating of captured information and knowledge, and its presentation within the TKR was 7.798/10 or 77.98%. Given the responses received from the project teams, it can be deduced that whilst there is additional time required to complete the TKR over the previous processes, the quality of information and knowledge that is captured is higher.

Chapter 6 – Conclusion:

6.1 Conclusions

This project aimed identify and design process improvements that would enable the effective and efficient knowledge management and transfer for estimating and project management teams. To achieve this aim, the following objectives were identified:

- Understand relevant literature for knowledge capture, management, and transfer, lean construction theory, and value stream mapping for process re-engineering.
- Determine the current usage, perceived need of, and suggested improvements to the existing procedures in place at the sponsor's organisation, by both estimating and project management teams.
- Design process improvements that can be implemented into the existing quality assurance system, which will assist in effectively gathering, codifying, and transferring project knowledge between key stakeholders.
- To compare the proposed process improvements with the outputs typically delivered using the existing systems and processes, by way of a review from key project stakeholders from estimating and project management teams.

To understand the literature pertaining to the topic, an extensive literature review was undertaken. It identified that that in Australia, there is a gap in the knowledge regarding processes which may be employed for the gathering and transfer of tacit project knowledge between estimating and project management teams. There proprietary software systems available to assist in the management of project information. However, there are limitations to their application for the capture or management of tacit knowledge.

The literature review identified that effective knowledge management is critical to the success or failure of construction projects. The role of key stakeholders with tacit project knowledge was identified. Solutions were identified for the successful implementation of new procedures in construction companies.

Finally, the literature surrounding Lean Construction was reviewed and discussed. Value stream mapping was identified as an appropriate Lean tool to form the basis of the project methodology for improving the transition of a successful tender from estimating to project management phases.

The five phases of value stream mapping: The initial analysis, the current state map, the future state map, the action plan, and experimentation, were undertaken in succession.

The initial analysis involved the interviewing and surveying of the estimating and project management teams respectively, and determining the requirements from each team for the transition process.

Mapping the current state involved the review of each step in the information and knowledge management processes within tender process, to determine potential inefficiencies and wastes. Mapping the future state involved re-engineering the existing processes, removing wastes and implementing efficiencies. It was determined that an integrated workflow system be implemented, as a part of an overall live knowledge capture model.

The action plan involved designing the revised tender management procedure and flowchart, and the integrated workflow solution. The proposed IWS was formatted as a spreadsheet (named the Tender Knowledge Register), with different tabs representing each step in the tender process, with prompts to assist the estimating team in identifying and codifying reusable project knowledge. The IWS and associated tender documentation was to be stored electronically in the project knowledge file (tender folder) for transfer to project teams, should the tender be successful.

Experimentation involved the re-surveying of estimating and project management stakeholders, and analysis of results to determine the system's relevance both to THE SPONSOR and the wider construction industry. The results were generally positive. A similar amount of time was required to complete both the existing and proposed processes, but the estimating and construction stakeholders collectively agreed that the proposed processes represented increased quality of information.

6.2 Project Limitations

The scope of the project was limited to the knowledge and information transfer between estimating and project management teams. It was noted that there is opportunity to apply lean management tools to other processes and information transitions within the project lifecycle, however it was determined that focusing on more than stage of the project lifecycle would exceed the scope and intent of this undergraduate research project.

Additionally, it was identified that any proposed process changes must be tested in real-time on projects prior to being implemented into THE SPONSOR's quality assurance systems. Due to time constraints a case study was not able to be completed in real time (Refer 6.3 Further work / Recommendations).

It was noted that the response rates to stakeholders (being the estimating and project management team members) who would be the end users of the systems, was poor. The lower-than-expected response rates to surveys resulted in a higher margin of error relating to the accuracy of responses.

The initial interviews and surveys required more qualitative and quantitative responses from respondents. Whilst qualitative responses assisted in the re-engineering of processes, it was noted that the lack of quantitative data made comparison of the scores from the revised processes complex.

6.3 Further work / Recommendations

This research project has highlighted the need for for effective capture of project information and knowledge by estimating teams to be transferred to project teams. It was aimed at developing process or procedure that can be implemented to improve the transition of a successful tender from estimating to project management. It has provided a framework for this, through the proposed tender knowledge register, accompanied by the estimating process flowchart (included in the revised ESP01 tendering procedure). However, further work is recommended in order to improve the system.

Further recommended work includes the adaptation of the system to an online, live platform. The literature on live knowledge capture (Refer 2.7 – Knowledge Capture and Re-Use Strateg) demonstrates that the most effective knowledge capture systems occur via an online platform that is accessible from anywhere with an internet connection. An example of this could be the estimator taking a Tablet PC to the site inspection and not only recording notes as dictated by prompts in the TKR, but being able to take and store site photos in the same location. This would mitigate the need to carry an external camera, and reduce the time taken in transferring and filing site photos from the camera.

A common suggestion from the initial estimating interview was that the estimating team require feedback from project management over the duration of a project, to understand if their

pricing and methodologies were accurate. The implementation of the TKR into an online platform would allow for the establishment of feedback loops to estimators (as trades are let, works completed etc.). This could be by way of periodic email summaries of project works and costings which could be distributed automatically through the system. The online platform could be linked to a proprietary EDMS which would allow for the incorporation of document management into the information/knowledge management of tenders and projects.

The implementation of an unsuccessful tender's archive would allow for the estimating team to access information and knowledge captured in previous tenders (not only the tenders that they were involved in, but their fellow team member's previous tenders also). The implementation of an easily accessible database of this information would assist in conveying the importance of knowledge capture to estimating team members, as they would be able to use this information in future tenders. By being able to use the most valuable information and knowledge from previous tenders, the estimating team will be able to continuously improve outputs and increase quality of tenders. They will also be able to apply lessons learned to mitigate future tender risks.

The proposed system should also address the refinements that have been identified by the project stakeholders through the final surveys. These include the re-naming of "Project Start-Up to "Tender Start-Up", the inclusion of certain items of project knowledge as requested. Additionally, formatting changes were identified that, if implemented, would assist in the flow and efficiency of the process.

A detailed training module should be developed, which would explain both the use and need for the system. When reviewing the results from the final estimating and project team surveys, it because evident that certain team members did not understand the system or it's need. To mitigate the risk of non-acceptance of the proposed changes, and ensure their efficiency, the training module should be developed.

Finally, the proposed systems should undergo further testing through the real-time application of the system to construction tenders. It is essential to the success of the process that it be tested on successful tenders, to measure the effectiveness, efficiency, and quality of the information and knowledge transfer with 100% confidence in results. Further (compulsory) testing of the process, combined with minor refinements, has the potential to produce a powerful knowledge management system that can be implement to continuously improve knowledge transfer

between estimating and project management teams. The system would be applicable to both THE SPONSOR, and with minor adjustments, other organisations in the industry.

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Appendix A – ENG4111/4112 Research Project: Project Specification [Rev 1]

For:

Joseph Richardson

Title:

Improving the transition of a successful tender from Estimating to Project Management phases

Major:

Management

Supervisors:

Paul. A. Tilley

Sponsorship:

FK Gardner and Sons Pty Ltd. Contact: Scott Carter, Group Manager Systems

Confidentiality:

Commercial in Confidence

Enrolment:

ENG4111 Semester 1, 2016, EXT

ENG 4112 Semester 2, 2016, EXT

Project Aim:

To investigate potential improvements to the management of information and documentation within the Estimating division of FK Gardner and Sons Pty Ltd (FKG), and the transition of this information to project teams upon the award of a project to the company.

PROGRAMME (ISSUE B, 16TH MARCH 2016):

1. Undertake a cultural investigation into the the estimating and project teams, primarily searching for:
    a. Why do they operate in such a manner that leads to the poor transfer of information, and why they do not follow procedures that are already in place.
    b. How can the team "Do this better"? What needs to change or be improved so that the estimating team will be able to effectively package information for the construction teams?

    c. What incentives can be put into place to ensure that the improved model becomes the status quo, rather than a temporary improvement before old ways return?

2. Research into:
    a. Document management systems and software (both generally and in construction).
    b. Knowledge capture
    c. The cultural issue within construction – why is there a lack of interest in internal innovation
3. Map the value stream to find the wastes of time, effort, and expense within the existing systems. Design process improvements to enable the most efficient and effective conveying of information, with minimal waste.
4. Implement and test the proposed design improvements, focussing on:
    a. Efficiency – did the process reduce (or not increase) the estimator's workload
    b. Effectiveness – was the correct information provided to the teams
5. If time permits, implement revised process improvements and re-test.
6. Make recommendations as to proposed process improvements.

Appendix B – ENG4111/4112 Research Project – Project Plan [Rev 3]

(To be read in conjunction with Project Specification)

For:

Joseph Richardson

Title:

Improving the transition of a successful tender from Estimating to Project Management phases

Major:

Management

Supervisors:

Paul. A. Tilley

Sponsorship:

FK Gardner and Sons Pty Ltd. Contact: Scott Carter, Group Manager Systems

Project Timeline / Programme (Issue B):

Week Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Week Ending Date	4/03/2016	11/03/2016	18/03/2016	25/03/2016	1/04/2016	8/04/2016	15/04/2016	22/04/2016	29/04/2016	6/05/2016	13/05/2016	20/05/2016	27/05/2016	3/06/2016	10/06/2016	17/06/2016	24/06/2016	1/07/2016	8/07/2016	15/07/2016	22/07/2016	29/07/2016	5/08/2016	12/08/2016	19/08/2016	26/08/2016	2/09/2016	9/09/2016	16/09/2016	23/09/2016	30/09/2016	7/10/2016	14/10/2016
Cultural Investigation into Estimating																																	
Survey Design																																	
Interview Stakeholders																																	
Data analysis of Survey results																																	
Research																																	
Survey Design																																	
General topic research (all 10 areas)																																	
Refined research Topics 1 & 2																																	
Refined research Topics 3 & 4																																	
Refined research Topics 5 & 6																																	
Refined research Topics 7 & 8																																	
Refined research Topics 9 & 10																																	
Preliminary Report (25/05)																																	
Progress Assessment (15/06)																																	
Value Stream Mapping																																	
Process Design																																	
Prepare Draft Dissertation																																	
Partial Draft Dissertation (07/09)																																	
Implement & Test Proposed Process Improvements																																	
Prepare Final Dissertation																																	
2016 Dissertation																																	

Assessment Items
Mid and End Semester Breaks

Appendix C – Consent Form for Participation in Research Project by survey and/or interview/s

Insert Interview / Survey Title

I _____, being over the age of 18 years hereby consent to participate as requested in the survey and/or interview/s for the research project titled "*Improving the transition of a successful tender from Estimating to Project Management phases*", undertaken by Joseph Luke Richardson in 2016 to fulfil the requirements of ENG4111 and ENG4112 – Engineering Research Projects Part I and II respectively.

1. I have read the information provided to me.
2. Details of survey and/or interview/s has been provided to me.
3. I am aware that I should retain a copy of the Consent Form for future reference.
4. I understand that:
    A. I may not directly benefit from taking part in this research.
    B. While the information gained in this study will be published as explained, my contact and personal details will remain strictly confidential
    C. I am free to withdraw from the project at any time and am free to decline to answer particular questions for any reason.
    D. Whether I participate or not, or withdraw after participating, will have no effect on any treatment or service that is being provided to me.
    E. The project is sponsored by FK Gardner and Sons Pty Ltd, however is being undertaken independently, and is not directly related to, nor has bearing on my current or future role within the organisation.

Respondent signature _____Date____/____/2016

I certify that I have explained the study to the volunteer and consider that she/he understands what is involved and freely consents to participation.

Researcher's name: Joseph Luke Richardson

Researcher's signature_____Date____/____/2016

Appendix D – Initial Estimating Team Interview

Preamble:

FKG's Estimating procedures are outlined in the "ESP01 – Tendering, contractor prequalification and procurement management procedure" (was provided to respondent in hard copy). The purpose of the ESP01 is "to ensure that tendering and estimating processes are conducted in accordance with state and federal ethics in tendering guidelines" (Direct quote). It is not solely based around document management, but is a guide for the main processes involved from pre-qualification through to estimating, subcontractor selection, and pre-contracts management.

Instructions:

For the interview, the team member will be presented with a copy of the ESP01 and associated forms and procedures. They will then be asked the following questions (responses to be audio recorded, with notes taken simultaneously by interviewer):

QUESTION 1:

With regards to FKG's procedures outlined in the ESP01, looking at the document as a whole, are the processes outlined in the ESP01 relevant to current practises in the estimating team? (ask respondent to select one of the below).

A. Yes – 100%. Followed by myself and to my best knowledge, all other members of the team.
B. Most processes are followed by the estimating team, with only some departures from the documented processes.
C. Some of the procedures are followed and used, but there are several which aren't/are no longer applicable or followed.
D. The procedures provide a general overview of how the team should operate, but are not particularly reflective of our current processes.
E. I do not recognise this document or the processes or procedures that it contains
F. Unsure

QUESTION 2:

The internal forms which relate to each part of the estimating and tendering process (both as outlined in the ESP01), are listed below:

- ES00 - Construction Tender Approval
- ES01 - Quotation Request
- ES02 - Quotation Request - Addendum No.

- ES03 - Trade Break Up Form
- ES05 - Site Visit Report
- ES06 - Tender Register (This Document is missing)
- ES07 - Estimating Meeting Minutes
- ES09 – Tender Review Legal (Labelled ES09CV - Civil Tender Contract Review)
- ES12 - Tender, Contract and Opportunity Review
- ES13CV - Estimate Process Checklist (This Document is missing)
- PDT - Procurement Decision Tree

In Addition, the following are available from "The Store" (FKG's Internal Document Server):

- ES08 – Legal Review
- ES10 – Subcontractor Prequalification Questionnaire
- ES11 – National Code Compliance Subcontractor Prequalification Questionnaire

A. With regards to the listed forms above, please indicate both their effectiveness, and how often you would use each of them, using a scale of 0 – 10, with 10 they are very effective and used for every tender, and 0 being "I do not recognise / I have never used this form".
B. Now looking at each form, please explain why you have given it the rating that you have – explain what it is about these forms (or processes involving these forms) that makes them relevant or not to current information management and transfer practises?

QUESTION 3:

Regarding those forms/processes which you do use regularly:

A. Can you provide an estimate as to how much time (on average, in hours) is involved in complying with the procedures and associated forms (e.g. How much time involved in completing an ES12, and associated handover meeting)?
B. Are there improvements which could be made to any form (please list)?

QUESTION 4:

Regarding those forms/processes which are generally not used (if unfamiliar, please review each form before answering):

A. Can you provide an estimate as to how much time (in hours) would be involved in complying with the procedures and associated forms?
B. What is it about these forms (or processes involving these forms) that makes them less relevant to current information management and transfer practises? If they are relevant or could or would be helpful, can you identify why they aren't used?

QUESTION 5:

Regarding document management processes in general (within Estimating) at FKG:

A. Is there anything which, in your opinion is not captured, that is relevant and applicable to all or most tenders?
B. What procedures have developed over time in the Estimating department (That aren't captured in the ESP01)? (e.g., the use of external subcontractor databases or document management systems). Why have these developed or implemented?

QUESTION 6:

Regarding document and information transfer within FKG:

A. When a tender is successfully converted, how are documents transferred from the Estimating to Construction teams? Choose one response:
    - Face-to-face
    - Hard Copy
    - Soft Copy
    - A combination (please elaborate?)
    - Unsure
B. Why is it done this way (effectiveness or efficiency or both)?
C. What information do you consider as key to pass onto construction teams in order to help with project success?
D. What information is commonly missed in the transfer between divisions?
E. What could be improved to ensure that (d) is not missed in the future?

QUESTION 7:

Now, looking at the industry as a whole (calling on your experiences both within FKG and at other companies) regarding document and information transfer:

A. If you had to classify the "industry-common" practises for information transfer, how would you categorise it generally:
    - Highly satisfactory
    - Satisfactory
    - Acceptable
    - Poor
    - Very Poor
    - I'd rather not say/unsure (limited experience with other companies)
B. Please explain your response to 7a.
C. Please rate FKG's practices compared to industry-standard:

- World's Best / Industry Leading
- Satisfactory
- Acceptable
- Poor
- Very Poor
- I'd rather not say/unsure

D. If your response to (c) was not "World's best", where could FKG improve?

Appendix E – Initial Project Teams Survey

QUESTION 1:

Considering the information received from the Estimating team when a project is converted. Overall, how would you consider the quality and presentation of information transferred between Estimating and construction? (feel free to elaborate on responses).

A. Excellent. All information is received in an easy-to-negotiate manner, with important highlighted information easy to find
B. Good. We receive the information that we need, though it could be better packaged or organised for us, and/or there might be some missing info
C. Acceptable. We mostly get what we need. The presentation and packaging of information is ok, but could be improved.
D. Poor. We generally receive information from estimating that is incomplete, or wildly varied in quality from person to person.
E. Very Poor. We never receive the information we need in an interpretable fashion.
F. Unsure.

QUESTION 2:

Referring to your response to Question 1, can you please provide some detail as to the quality and quality of information received from the estimating team?

QUESTION 3:

What impact does the quality of information provided by the estimating team, have on project commencement and success?

A. Huge Impact. Without the correct information, the project will suffer.
B. Considerable Impact. The project can commence without all of the information from the estimating team, but it greatly increases the risk of error and potential loss of margin.
C. Some Impact. The project information received from the estimating team is helpful, but not critical to project success.
D. Little Impact. The project information received from the estimating team has little effect on project success.
E. No Impact. The project information received from the estimating team has no effect on project success.
F. Unsure/Don't Know

QUESTION 4 (PART I):

The "ES12 Tender, Contract and Opportunity Review", available for viewing here (Hyperlink was inserted) is an internal FKG form used by the Estimating team when a project is awarded, to convey project information to the project team. The information/questions currently included in this form is listed below. Please tick all of the project information elements that you believe are important to the project team, at project commencement?

- Tender particulars Generally (Listed Below)
- Tender Principal
- Contract with Principal/Head Contractor?
- Correct Entity to Utilise 1.4 Scope of Work
- Commencement
- Anticipated Completion
- Project Location Particulars/State
- Provisional Sums
- Separable Portions
- Annexure Part A - General Conditions of Contract
- Nature of Contract:
- Contractor, Subcontractor, Supply, Hire
- Security/Retention
- Percentage reduction to Security/Retention
- Undertakings
- Notice period Security/Retention Recourse
- Subcontracting
- Latent Conditions
- Special permits, consents, approvals required for the project?
- Indemnities
- Insurance Requirements
- Suspension/Stand-down
- Delay/Disruption costs/Force Majeure
- Extensions of Time
- Liquidated damages
- Defect Liability Period
- Warranties
- Variations
- Certificates, Payment Claims, Time for Payment

- Payment of workers /Subcontractors (incl. allowances, 10% training policy, Indigenous content)
- Default
- Termination by Frustration
- Disruption
- Building Code 2013/FSC Requirement
- Dispute Resolution
- Annexure Part B – Special Conditions Amending the General Conditions
- Covering Letter Comments
- Tender Opportunities (Generally, listed below)
- What matters does the Estimating team consider as significant matters/processes for the go forward of the project?
- Describe key Client expectations, objectives, requirements, critical success factors and or focus points for the project
- Financial Opportunities within the tender Submission
- Potential HC variations
- Financial Risks or items that may negatively influence the project budget
- Matters that have influenced the tender preparation and or submission
- Propose approach in managing Clients/Clients PM and or superintendent
- Strengths in tender submission
- Weaknesses in tender submission
- Nominate any constraints that have been placed on the opportunity or the delivery of the project
- What is FKG's competitive advantage in the tender submission?
- In the preparation of the tender what assumptions has the Estimating team made
- From managing the tender process how does the Estimator consider FKG's performance will be measured during the delivery process
- As a group how can FKG contribute to the community while undertaking this project
- Describe the current political landscape, external influences, relationships that may have been a bearing on the success or determinant of the opportunity / project
- Provide a description of the Client or Superintendent
- Describe what is the big picture
- Estimator to provide a communication Table (ES03) including contact names role and contact numbers.

- Estimator to provide a transmittal document to the Project team of all drawings, specs and project documents handed over
- How does the Estimator propose an approach for the delivery team to inter-operate and dissected the information that has been presented?
- Describe how the build method within the tender program came to be
- Has the Estimator made any unwritten commitments or promises to any party thus far, if so please describe?
- Provide a reason (how or why) FKG where successful on this tender submission
- From the tender process Estimator to provide comment of industry knowledge, trends and industry landscapes that may have an effect on the forward direction of the project.
- How has innovation, value add, value engineering techniques and ingenuity been applied to the tender submission and be applied in the delivery of the project
- Statutory requirements status
- Approval status
- Design documents status
- Complexity level of project is considered to be
- Where does the simplicity or complexity of the project lie?
- Estimator to provide a cash flow chart compatible to tendered build program
- Provide comment in regards to the quality of documents that Estimating team received during the tender phase
- The safety hazards that Estimating team have identified during the tender phase (include on WHS47 Design Risk Assessment)
- Within the tender submission what is the delivery model that the Estimating team has nominated?
- Are there any gaps of Subcontractor coverage with in the information presented to the delivery team?
- Where and why have rates been applied in the tender Submission?
- In chronological order describe the Scope of Works for the project?
- Estimator's Final Recommendations?

QUESTION 4 (PART II):

Please provide any comments relating to your selections

QUESTION 5:

Considering the Construction Industry as a whole now (calling on your experience both within FKG and at other firms); What is the minimum information that construction teams require

from their estimating teams, in order to still be able to commence projects as effectively as possible? (please list)

QUESTION 6:

Does the Estimating team at FKG generally provide all of the information you have listed above as being the minimum requirement? If not, which information do you find is commonly missed in the transfer between teams?

QUESTION 7:

Equally, is there any information or documentation that is often provided by the Estimating team at FKG, but is often not required?

QUESTION 8:

How do you think FKG rates with document and information transfer, when compared to industry standards?

- World's Best/Industry Leading
- Satisfactory
- Acceptable
- Poor
- Very Poor
- I'd rather not say / unsure

Appendix F – Summary of Initial Estimating Interview Results

QUESTION 1:

The summary of question 1 responses is included in Appendix F, Table 1below.

Appendix F Table 1: Summary - Estimating Interview Question 1 Responses:

QUESTION 1. LOOKING AT THE DOCUMENT AS A WHOLE, ARE THE PROCESSES OUTLINED IN THE ESP01 RELEVANT TO CURRENT PRACTICES IN THE ESTIMATING TEAM? (SELECT ONE OF THE RESPONSES BELOW).	
RESPONSE	NUMBER
a. Yes – 100%. Followed by myself and to my best knowledge, all other members of the team.	0
b. Most processes are followed by the estimating team, with only some departures from the documented processes.	0
c. Some of the procedures are followed and used, but there are several which aren't/are no longer applicable or followed.	6
d. The procedures provide a general overview of how the team should operate, but are not particularly reflective of our current processes.	2
e. I do not recognise this document or the processes or procedures that it contains	1
f. Unsure	0

QUESTION 2:

The summary of Question 2 responses is included in Appendix F Table 2 below.

Appendix F, Table 2: Summary - Estimating Interview Question 2 Responses:

QUESTION 2. THE INTERNAL FORMS WHICH RELATE TO EACH PART OF THE ESTIMATING AND TENDERING PROCESS (BOTH AS OUTLINED IN THE ESP01), ARE LISTED BELOW. PLEASE INDICATE BOTH THEIR EFFECTIVENESS, AND HOW OFTEN YOU WOULD USE EACH OF THEM, USING A SCALE OF 0 – 10, WITH 10 THEY ARE VERY EFFECTIVE AND USED FOR EVERY TENDER, AND 0 BEING "I DO NOT RECOGNISE / I HAVE NEVER USED THIS FORM".		
FORM	RATING	SUMMARY OF EXPLANATIONS
ES00 - Construction Tender Approval	6.0	This is a relevant form, completed by the the pre-contracts administrating team, but not to the estimating team. The form contains information which pertains to Estimating, but is located by the Estimator once they have been allocated the tender.
ES01 - Quotation Request	2.8	This form was used in the past by the estimating team but is no longer relevant as quotation requests are managed through the EstimateOne Portal
ES02 - Quotation Request - Addendum No.	2.8	This form was used in the past by the estimating team but is no longer relevant as tender addendum notifications are managed through the EstimateOne Portal
ES03 - Trade Break Up Form	1.8	This form was used in the past by the estimating team but is no longer relevant as the subcontractor break up distribution are managed through the EstimateOne Portal, which provides a print-out at tender completion of all subcontractor details, documents sent/downloaded etc.
ES05 - Site Visit Report	5.1	This form has had mixed use in the estimating team. One estimator questioned the relevance of a site inspection form, citing that "all estimators should make their own notes" when visiting sites. Others perceive it as useful, but have never completed it.
ES06 - Tender Register (This	3.7	Estimating assistant maintains estimating tender register. Document is protected with limited access, hence template not being available.

Document is missing)		
ES07 - Estimating Meeting Minutes	0.5	This form has generally never been used, however some noted that team meetings should be minuted.
ES09 – Tender Review Legal (Labelled ES09CV - Civil Tender Contract Review)	1.6	This form relates to another division of the FKG Group. This form is not used by the construction team, however does contain similar contractual information as the ES08 and ES12 forms
ES12 - Tender, Contract and Opportunity Review	6.7	This form is still used upon successful conversion of a tender, however estimators noted several double-ups of information and data. It is a laborious and long form to complete.
ES13CV - Estimate Process Checklist (This Document is missing)	0.3	This form relates to another division of the FKG Group. It is semi-related to the ES00 form but not used by the Estimating team
PDT - Procurement Decision Tree	3.6	This form is used by Management in selecting tenders for the team. It is not completed by Estimators, nor do they have input.
ES08 – Legal Review	2.2	This form is no longer used/recognised by estimating team. Tender legal information is recorded in contract review provided to estimating team, and copied into ES12 form.
ES10 – Subcontractor Prequalification Questionnaire	0.8	This is related to procurement in project delivery phase
ES11 – National Code Compliance Subcontractor Prequalification Questionnaire	0.0	This is related to procurement in project delivery phase

QUESTIONS 3 AND 4 (PART I):

Relate to time cost of each procedural and form. Were asked to provide explanations regarding their use (or lack of use) of forms. A summary of the time taken to complete each form is included in Appendix F, Table 3 below.

Appendix F, Table 3: Summary - Estimating Interview Question 3A and 4A Responses:

QUESTION 3 AND 4 - TIME TO COMPLETE THE FORMS, AND NOTES REGARDING THEIR COMPLETION		
FORM	**TIME (HOURS)**	**NOTES**
ES00 - Construction Tender Approval	1.1	This is completed by the Pre-Contracts Team. The Estimator then either uses the majority of this information, or spends time locating it (again) to put into EstimateOne for the subcontractors to view before quoting the project.
ES01 - Quotation Request	0.6	This is no longer relevant. Times are estimated only
ES02 - Quotation Request - Addendum No.	0.4	This is no longer relevant. Times are estimated only

ES03 - Trade Break Up Form	3.3	This is replaced by the use of EstimateOne (E1). Time estimates are provided for the process of selecting trades and subcontractors from the online database maintained in E1, and completing a document matrix to dictate which trade receives what tendering information and documentation.
ES05 - Site Visit Report	2.2	Estimated time only - Generally form not completed. Completion of the form would depend on the site visited, and the project complexity, safety, access etc.
ES06 - Tender Register	0.6 (x3)	This is an estimated amount of time per update, per tender, for the Estimating Assistant to enter and maintain the tender particulars noted in the register. Estimating Assistant estimates 2-3 updated over the course of each tender.
ES07 - Estimating Meeting Minutes	0.6	Average estimated time to complete during a meeting (meeting length is not set). Team meetings conducted fortnightly. Tender-specific meetings generally conducted at commencement and completion (2x per tender)
ES09 – Tender Review Legal	2.3	This is no longer relevant. Times are estimated only
ES12 - Tender, Contract and Opportunity Review	3.2	Time to complete depends on complexity of tender. Often details are completed in the estimating handover meeting, rather than in advance.
ES08 – Legal Review	1.9	This is generally not completed by the estimating team. Times are estimated only
ES10 – Subcontractor Prequalification Questionnaire	0.25	This is no longer relevant. Times are estimated only (per subby)
ES11 – National Code Compliance Subcontractor Prequalification Questionnaire	0.25	This is no longer relevant. Times are estimated only (per subby)
SUM	**17.9**	**HOURS**

QUESTIONS 3 AND 4 (PART II):

Respondents were called upon to make suggestion as to improvements or changes which would be implemented with the existing procedures or forms. A general summary of the comments received relating to the forms is as follows.

- The existing forms do not show the current practises of the estimating team.
- All team members noted that the use of the EstimateOne portal renders the ES01, ES02, and ES03 useless.
- EP2-EP9 inclusive noted that the ES08 and ES09 forms are almost identical, however all information captured in both of these forms is also captured by the ES12, so completing them results in the double-up of information entry. Additionally, the contractual review is generally completed by the contracts management team, and sent to the estimator for review. This information is then again entered into the ES12 form.

- EP3-9 inclusive commented that the ES10 and 11 forms have been deemed not applicable to Estimating, as at tender time the estimator is concerned with obtaining a quote for the work, not procuring a subcontract.
- EP4 states "Some key points [that] could be discussed include pricing and project risks, possibilities, and assumptions".
- EP6 Noted that "Having one program or system to manage documents, quotes, the estimate itself, and a handover would be ideal".

QUESTION 5A:

A summary of responses is listed in Appendix F, Table 4 below:

Appendix F, Table 4: Summary - Estimating Interview Question 5A Responses:

QUESTION 5A. IS THERE ANYTHING WHICH, IN YOUR OPINION IS NOT CAPTURED, THAT IS RELEVANT AND APPLICABLE TO ALL OR MOST TENDERS?	
RESPONDENT	**RESPONSE**
EP1	General communication seems to be lacking. There needs to be central communication points from FKG to all external parties (e.g. Some staff will receive documents etc. for tenders, but these should be sent to a central point).
EP2	Risk is commonly missed. The understanding of risk (being contractual, documentation-related, management, price, subcontractors) is generally poorly transmitted between Estimating and Project Management. There is no mention of the submissions team in the ESP01. They play a vital role in tender submissions.
EP3	Feedback to Estimators from project management is poor - unless trades do not make profit. Communication needs to increase for estimators to gain better understanding of current trends in pricing
EP4	Ideally, having set trade scoped would eliminate risk, but it is impractical to write comprehensive trade scopes during tender period for time constraints.
EP5	We don't have a register of costs for different buildings/projects which can be used for future high-level cost planning
EP6	Key risk items are: Nominated subbies plant, equipment, FFE requirements (often overlooked and potentially costly), and specialist procurement items (lead times, cost, etc.)
EP7	Nil Comment
EP8	Site Risks, material price changes
EP9	Emails that contain important information but are not part of the official tender document issue

QUESTION 5B

Respondents if there were any non-documented or ad-hoc procedures which had developed/ were followed, and why:

- All respondents (EP1-EP9) inclusive mentioned the use of the external document portal, EstimateOne.
- EP6, EP3 have developed their own checklists to ensure that they capture project information.
- EP1 noted that the role-specific ES06 has been modified over time and EP1 is therefore un-aware of the original configuration of the form.

- EP2 Notes that the pre-contracts team do not use estimating forms (have own QA).

QUESTION 6A:

All respondents (EP1-9 inclusive) selected response "*A combination of hard copy and electronic documents*". A summary of their comments relating to this response (QUESTION 6B) is located in Table 5 below.

Table 5: Summary - Estimating Interview Question 6B Responses:

QUESTION 6B. WHY IS THIS THE CASE [THAT AT FKG TENDER INFORMATION IS TRANSFERRED IN A COMBINATION OF FORMATS]?	
RESPONDENT	**RESPONSE**
EP1	Efficiency and effectiveness
EP2	Face to face is good to "tell the story" of the project and allows QandA. HC [hard copy] is becoming less relevant, but should remain relevant as estimators tend to mark-up and make notes on the [subcontractor's] quote[s]. This information can be vital
EP3	It is easier to discuss project particulars face-to-face but hard copies of documents are still required.
EP4	It provides the documentation in hard copy as required, but also gives project teams the opportunity to question estimating team
EP5	We provide a full hard copy of all documents, but it is more about "covering ourselves" than anything else. So that if a dispute arises with the PM team regarding any documents, quotes etc., we have evidence of what was provided. Key hard copies of certain documents for discussion should be provided, not the whole set.
EP6	Nil Comment
EP7	It works best this way
EP8	Nil Comment
EP9	Nil Comment

QUESTION 6C, 6D, 6E:

Respondents were asked to list the information that they personally considered most vital for tender handover, what information is commonly missed [edit: this is closely related to Question 5a and responses were similar], and recommendations for capturing this information in the future. A response summary is located in Table 6 below:

Table 6: Summary - Estimating Interview Question 6C, 6D, 6E Responses:

QUESTION 6C, 6D, 6E - WHAT INFORMATION DOES INTERVIEWEE CONSIDER IMPORTANT? WHAT IS COMMONLY MISSED? WHAT COULD BE CHANGED TO ENSURE IT ISN'T MISSED IN THE FUTURE?	
RESPONDENT	**RESPONSE**
EP1	Full document set, Addenda, Organised quotes, Correspondence
EP2	Subby Coverage, Tender Clarifications, and risk (Site, Client, Scope, communication, contract, pricing, contract management, even PM assigned to project could be a risk). Risk is most commonly missed. Make a checklist of different risks to be at least noted and discussed (even if they don't apply to a particular project, they can be used for a reference point check. Involving project managers at tender time would also greatly reduce error in transferring information, as they will already have a commitment and involvement in the project.

EP3	Hard copy documents are important for the project teams to understand the project. Quotes are especially important in hard copy. Commonly PM doesn't read through hard copy information provided. This should be explained in detail by estimator but generally no time.
EP4	Refer other comments – Explaining and understanding risk is vital
EP5	Budget and selected subcontractors, Methodology that influenced the pricing, Program, Identification of risks + opportunities. Going through trades in detail is missed normally for time and laziness. Involving PM team from the start is ideal.
EP6	The key is to explain where have FKG has taken risk on subbies or trades, and why. E.g. undercutting subcontractor quotes as you believe them to be inflated. A heads up as to trades that can be discounted (if they haven't already been post-tender). Quality of quotes received. Major lead time items on the project. During handover must explain how scope is divided between trades (especially if trades are lumped together in client pricing schedules)
EP7	Assist estimators with names of subcontractors that they know and work well with; assist with buildability advice; review programmes
EP8	Project risk, marked-up subby quotes, marked-up plans
EP9	Risks in subcontractor coverage. Alternative methods of construction. Key subcontractors who have assisted in winning the tender to be given final opportunity at subcontract letting.

QUESTION 7:

Respondents were asked for their opinion of the "industry standards" for tender handover, and FKG's ranking against other organisations. The rankings are summarised in Table 7 below:

Table 7: Summary - Estimating Interview Question 7:

RATING	INDUSTRY PRACTICE	FKG IN COMPARISON TO INDUSTRY
Highly satisfactory (7A) Industry Leading (7B)	0	0
Satisfactory	6	7
Acceptable	0	1
Poor	2	0
Very Poor	0	0
I'd Rather Not Say/Unsure (limited industry exposure)	0	1

Generally, comments regarding the industry were that there is no particularly standout way to achieve successful transfer between teams (in the experience of the interview respondents), but that FKG's current practices do provide a satisfactory, but not stand out amount of information to project teams.

Appendix G – Initial Project Teams Survey Results

QUESTION 1:

CONSIDERING THE INFORMATION RECEIVED FROM THE ESTIMATING TEAM WHEN A PROJECT IS CONVERTED. OVERALL, HOW WOULD YOU CONSIDER THE QUALITY AND PRESENTATION OF INFORMATION TRANSFERRED BETWEEN ESTIMATING AND CONSTRUCTION? (FEEL FREE TO ELABORATE ON RESPONSES).		
Answer Options	Response Percent	Response Count
Excellent. All information is received in an easy-to-negotiate manner, with important highlighted information easy to find	9.1%	2
Good. We receive the information that we need, though it could be better packaged or organised for us, and/or there might be some missing info	54.5%	12
Acceptable. We mostly get what we need. The presentation and packaging of information is ok, but could be improved.	27.3%	6
Poor. We generally receive information from estimating that is incomplete, or wildly varied in quality from person to person.	0.0%	0
Very Poor. We never receive the information we need in an interpretable fashion.	0.0%	0
Unsure.	9.1%	2
answered question		22
skipped question		1

QUESTION 2:

REFERRING TO YOUR RESPONSE TO QUESTION 1, CAN YOU PLEASE PROVIDE SOME DETAIL AS TO THE QUALITY AND QUANTITY OF INFORMATION THAT IS USUALLY HANDED FROM THE ESTIMATING TEAM TO THE CONSTRUCTION TEAMS?		
Number	Response Date	Response Text
1	Sep 25, 2016 6:02 AM	We get all the quotes, tender documents and program
2	Sep 21, 2016 2:14 AM	Generally, all aspects of the tender have been accounted for in their submission to the client and handover to construction is paramount to the attainment of the project. In DandC projects, the brief will dictate the design requirements and our estimators will cover all client condition in preliminary specifications prior to full documentation but small incidentals can be missed. The impact of this can be a major factor in the outcome of the project and can determine the merit of future leads if unsuccessful.
3	Sep 21, 2016 12:20 AM	The estimating handover process at FKG is generally to a high standard with a formal meeting held between construction and estimating teams, and all information discussed following the detailed FKG 'ES12' standard form. In some cases, items are missed in the handover and organisation could be better.
4	Sep 20, 2016 10:59 PM	The quality of information is generally acceptable but sometimes the timeliness of handover meetings could be improved. Greater attention could be paid to the qualifications stated on quotes used.
5	Sep 20, 2016 10:55 PM	At times, the construction methodology is not consistent with either the development of the cost plan / estimate by way of temporary works that need to be considered. This

		can extend to cost and time inconsistencies in the tender offer submission.
6	Sep 20, 2016 10:50 PM	THERE IS ALWAYS ITEMS THAT MIGHT NEED A DISCUSSION TO TALK THE ESTIMATOR ABOUT – THE HANDOVER IS GENERALLY GOING THRU KEY ITEMS
7	Jul 13, 2016 10:27 PM	Information to be in the correct folders, this does not always happen = downtime searching for info.
8	Jul 6, 2016 2:43 AM	As long as the tenders are filed on the server, which they mostly are, and we can ask questions about how prices were established, all I need.
9	Jul 5, 2016 4:19 AM	Submission package, tendering information, addendum, post tender negotiations, and information on any pre involvement from subcontractors and consultants provided by the Estimator / Bid Manager at handover to construction is valuable and suitable.
10	Jul 5, 2016 12:08 AM	Information regarding the estimate of the project will be handed over to the project team. Any "Grey" areas as such, are highlighted to the project team. There is no presentation of the estimate, merely a BOQ or estimate summary.
11	Jul 4, 2016 11:44 PM	Not a specific soft copy folder for the head contract, have to dig through information to get it. All quotes in a file together. Although these files are named clearly, it is often that not all trades are together in the pile. Don't think a hard copy of documents is required - but in saying this, should any notes be written on quotes, these should be scanned in prior to handover to construction.
12	Jul 4, 2016 11:30 PM	Generally, the hand over is good however there is normally 10% missing however this information can normally be retrieved by talking to the estimator.
13	Jul 4, 2016 11:01 PM	Pre-tender docs are generally in good nick. Post tender correspondence can be very disjointed and you will not receive a detailed - this is what the final submission entail. The only fixed part is the contract sum - especially when and extended post tender negotiation process occur before the project had been converted.
14	Jul 4, 2016 9:33 PM	From previous experience with other companies it has not been handle very well. Where it takes 2-4 weeks to price a project sometimes the handover is only 1-2 hours, skipping over the methodology of how the project was priced and not spending anytime reviewing possible risk and opportunities.
15	Jul 4, 2016 9:28 PM	Really depends on the estimator who prices the job, and no doubt the duration of the tender and whether they have enough time to organise as they prepare. Sinnamon Village project is very well organised.
16	Jul 4, 2016 9:10 PM	It is improving. The ES12 is normally populated and the hard copy folders are available with all the tender correspondence, documents and the subcontract quotes. The run through normally gets most issues that would be a concern for the delivery team.

17	Jul 4, 2016 7:03 AM	- Quotes file , hard copy - most trades have at least 3 quotes - Tender drawings , hard copy and original download - Addendums - Correspondence to and from Client - Questions from subbies - RFI's - Bill of Quantities - Submission to Client
18	Jul 4, 2016 6:41 AM	It is important to have hand over meetings, complete access to information received during tender process. Ability to reinvestigate options after project teams are given the green light to proceed with project
19	Jun 22, 2016 1:10 AM	The general layout of the tender information is well presented. I find that the post tender addendums/negotiations and correspondence can be lacking in organisation which makes it hard to find
	answered question	19
	skipped question	4

QUESTION 3:

WHAT IMPACT DOES THE QUALITY OF INFORMATION PROVIDED BY THE ESTIMATING TEAM, HAVE ON PROJECT COMMENCEMENT AND SUCCESS?		
Answer Options	Response Percent	Response Count
Huge Impact. Without the correct information, the project will suffer.	31.8%	7
Considerable Impact. The project can commence without all of the information from the estimating team, but it greatly increases the risk of error and potential loss of margin.	63.6%	14
Some Impact. The project information received from the estimating team is helpful, but not critical to project success.	0.0%	0
Little Impact. The project information received from the estimating team has little effect on project success.	4.5%	1
No Impact. The project information received from the estimating team has no effect on project success.	0.0%	0
Unsure/Don't Know	0.0%	0
	answered question	22
	skipped question	1

QUESTION 4 (PART I):

THE "ES12 TENDER, CONTRACT AND OPPORTUNITY REVIEW" (AVAILABLE FOR VIEWING HERE) IS AN INTERNAL FKG FORM USED BY THE ESTIMATING TEAM WHEN A PROJECT IS AWARDED, TO CONVEY PROJECT INFORMATION TO THE PROJECT TEAM. THE INFORMATION/QUESTIONS CURRENTLY INCLUDED IN THIS FORM IS LISTED BELOW. PLEASE TICK ALL OF THE PROJECT INFORMATION ELEMENTS THAT YOU BELIEVE ARE IMPORTANT TO THE PROJECT TEAM, AT PROJECT COMMENCEMENT?		
Answer Options	Response Percent	Response Count
1.0 Tender particulars Generally (Listed Below):	83.3%	15
1.1 Tender Principal	77.8%	14

1.2 Contract with Principal/Head Contractor?	72.2%	13
1.3 Correct Entity to Utilise	61.1%	11
1.4 Scope of Work	100.0%	18
1.5 Commencement	88.9%	16
1.6 Anticipated Completion	88.9%	16
1.7 Project Location Particulars/State	72.2%	13
1.8 Provisional Sums	88.9%	16
1.9 Separable Portions	83.3%	15
2.0 Annexure Part A - General Conditions Of Contract	77.8%	14
2.1 Nature of Contract:	83.3%	15
2.2 Contractor, Subcontractor, Supply, Hire	72.2%	13
2.3 Security/Retention	77.8%	14
2.4 Percentage reduction to Security/Retention	61.1%	11
2.5 Undertakings	66.7%	12
2.6 Notice period Security/Retention Recourse	55.6%	10
2.7 Subcontracting	83.3%	15
2.8 Latent Conditions	94.4%	17
2.9 Special permits, consents, approvals required for the project?	83.3%	15
2.10 Indemnities	72.2%	13
2.11 Insurance Requirements	72.2%	13
2.12 Suspension/Stand-down	55.6%	10
2.13 Delay/Disruption costs/Force Majeure	72.2%	13
2.14 Extensions of Time	83.3%	15
2.15 Liquidated damages	77.8%	14
2.16 Defect Liability Period	66.7%	12
2.17 Warranties	77.8%	14
2.18 Variations	77.8%	14
2.19 Certificates, Payment Claims, Time for Payment	83.3%	15
2.20 Payment of workers /Subcontractors (incl. allowances, 10% training policy, Indigenous content)	66.7%	12
2.21 Default	33.3%	6
2.22 Termination by Frustration	33.3%	6
2.23 Disruption	33.3%	6
2.24 Building Code 2013/FSC Requirement	61.1%	11
2.25 Dispute Resolution	27.8%	5
3.0 Annexure Part B – Special Conditions Amending the General Conditions	77.8%	14
4.0 Covering Letter Comments	77.8%	14
5.0 Tender Opportunities (Generally, listed below)	72.2%	13
5.1 What matters does the Estimating team consider as significant matters/processes for the go forward of the project	88.9%	16
5.2 Describe key Client expectations, objectives, requirements, critical success factors and or focus points for the project	88.9%	16
5.3 Financial Opportunities within the tender Submission	94.4%	17
5.4 Potential HC variations	88.9%	16
5.5 Financial Risks or items that may negatively influence the project budget	88.9%	16
5.6 Matters that have influenced the tender preparation and or submission	77.8%	14

5.7 Propose approach in managing Clients/Clients PM and or superintendent	72.2%	13
5.8 Strengths in tender submission	83.3%	15
5.9 Weaknesses in tender submission	83.3%	15
5.10 Nominate any constraints that have been placed on the opportunity or the delivery of the project	77.8%	14
5.11 What is FKG's competitive advantage in the tender submission?	66.7%	12
5.12 In the preparation of the tender what assumptions has the Estimating team made	88.9%	16
5.13 From managing the tender process how does the Estimator consider FKG's performance will be measured during the delivery process	55.6%	10
5.14 As a group how can FKG contribute to the community while undertaking this project	33.3%	6
5.15 Describe the current political landscape, external influences, relationships that may have been a bearing on the success or determinant of the opportunity / project	44.4%	8
5.16 Provide a description of the Client or Superintendent	50.0%	9
5.17 Describe what is the big picture	61.1%	11
5.18 Estimator to provide a communication Table (ES03) including contact names role and contact numbers.	72.2%	13
5.19 Estimator to provide a transmittal document to the Project team of all drawings, specs and project documents handed over	83.3%	15
5.20 How does the Estimator propose an approach for the delivery team to inter-operate and dissected the information that has been presented	33.3%	6
5.21 Describe how the build method within the tender program came to be	88.9%	16
5.22 Has the Estimator made any unwritten commitments or promises to any party thus far, if so please describe	77.8%	14
5.23 Provide a reason (how or why) FKG where successful on this tender submission	66.7%	12
5.24 From the tender process Estimator to provide comment of industry knowledge, trends and industry landscapes that may have an effect on the forward direction of the project.	44.4%	8
5.25 How has innovation, value add, value engineering techniques and ingenuity been applied to the tender submission and be applied in the delivery of the project	50.0%	9
5.26 Statutory requirements status	55.6%	10
5.27 Approval status	72.2%	13
5.28 Design documents status	72.2%	13
5.29 Complexity level of project is considered to be	44.4%	8
5.30 Where does the simplicity or complexity of the project lie?	38.9%	7
5.31 Estimator to provide a cash flow chart compatible to tendered build program	50.0%	9
5.32 Provide comment in regards to the quality of documents that Estimating team received during the tender phase	55.6%	10
5.33 The safety hazards that Estimating team have identified during the tender phase (include on WHS47 Design Risk Assessment)	55.6%	10
5.34 With in the tender submission what is the delivery model that the Estimating team has nominated	55.6%	10

5.35 Are there any gaps of Subcontractor coverage with in the information presented to the delivery team?	77.8%	14
5.36 Where and why have rates been applied in the tender Submission	77.8%	14
5.37 In chronological order describe the Scope of Works for the project	66.7%	12
5.38 Estimator's final recommendations	66.7%	12
Please provide any comments regarding your selections		13
	answered question	18
	skipped question	5

QUESTION 4 (PART II):

NUMBER	RESPONSE DATE	PLEASE PROVIDE ANY COMMENTS REGARDING YOUR SELECTIONS
1	Sep 25, 2016 6:02AM	Assumed construction methodology including temporary works is important
2	Sep 21, 2016 2:14AM	All section in the ES12 are important for project commencement, details pertaining to the delivery of the project are all contained within this section and successful planning can be implemented. Understanding the parameters early in the project can lead a team to successful completion, any concerns are resolved prior to works being undertaken.
3	Sep 21, 2016 12:20AM	While not ruling out other items as unimportant, above items are viewed as being most important to allow project team to commence the project most successfully
4	Sep 20, 2016 10:55PM	All of the above are an important communication to the site team to use as a reference for the tender estimate. The full communication of all aspects of the tender is necessary for the construction team to understand the recognised risks that have been identified and accounted in the development of the tender submission, from a financial and commercial aspect.
5	Sep 20, 2016 10:50PM	IT'S A GOOD LIST – COVERS THE MAJORITY/ ALL OF ITEMS
6	Jul 5, 2016 2:06AM	as much information as possible must be provided
7	Jul 4, 2016 11:44PM	Pretty happy with the form. It works as a really good introduction to a project, prior to meeting with clients are reviewing the documents yourself.
8	Jul 4, 2016 11:30PM	All items are important and required to complete a project
9	Jul 4, 2016 11:01PM	Project team member need to review the contract documents themselves. Having all the information provided in the ES12 result in some team members not reading any documents until it's too late. Critical information from my perspective - Contract document, Start, finish, contract sum and margin required by management.
10	Jul 4, 2016 9:33PM	Many of the items above are covered off in the Head Contract which is reviewed and summarised by the Building Team at handover. Items specific to scope, risks, opportunities , methodologies, building constraints etc. are the key to getting off on the right foot.

11	Jul 4, 2016 9:28PM	While a lot of the above items are helpful, getting clear information on each item isn't practical unless the estimator is given the time to collate the information. A lot of the items overlap, and some of the items are best discussed, not put in a written report, but having them noted as an agenda maybe a helpful prompt.
12	Jul 4, 2016 9:10PM	The above ticked items would be most relevant. The rest the delivery team could find out in due course if needs be.
13	Jul 4, 2016 7:03AM	All of the above is generally discussed in the PM13 Start up meeting

QUESTION 5:

CONSIDERING THE CONSTRUCTION INDUSTRY AS A WHOLE NOW (CALLING ON YOUR EXPERIENCE BOTH WITHIN FKG AND AT OTHER FIRMS); WHAT IS THE MINIMUM INFORMATION THAT CONSTRUCTION TEAMS REQUIRE FROM THEIR ESTIMATING TEAMS, IN ORDER TO STILL BE ABLE TO COMMENCE PROJECTS AS EFFECTIVELY AS POSSIBLE? (PLEASE LIST)		
Number	**Response Date**	**Response Text**
1	Sep 25, 2016 6:02 AM	Break up of budget. Documents submission is based on
2	Sep 21, 2016 2:14 AM	1. Budget 2. Risks and Opportunities 3. Tender Drawings 4. Contact Details
3	Sep 21, 2016 12:20 AM	Project documents Scope of works methodology Detailed budget breakdowns Trade quotations Special contract conditions
4	Sep 20, 2016 10:59 PM	Contract plans Scope of Works Budget Tender Quotes to match budget
5	Sep 20, 2016 10:55 PM	Commercial risks – review of contract conditions that attract risks to the Building Company's financial outcome targets, via terms of payment, damages. Design Risks, if the project carries a design obligation Program analysis, complete with any separable portions required to be achieved under the contract Extent of trade coverage in the preparation of the tender price, and the completeness and currency of the information issued to form the response to tender. The tender design documents used for the tender price, and any assumptions made of construction methodology.
6	Sep 20, 2016 10:53PM	Budget Breakdown, Subbie quotes, RFI's and responses
7	Sep 20, 2016 10:50 PM	COMMENCE IS A TRICKY WORD – THAT COULD MEAN ADMINISTRATION WISE/ START ONSITE/ DESIGN STAGE/ QUALITY ETC. SOME INFORMATION COULD BE LEFT OFF , BUT GENERALLY THIS INFORMATION IS NEEDED FROM THE START
8	Jul 13, 2016 10:27 PM	location. time frame. special conditions. client.

		tender breakdown. BOQ where applicable.
9	Jul 6, 2016 2:43 AM	Any pricing, correspondence or notes relating to how/ what pricing is based on. All documents received from the Client including notes of discussions etc.
10	Jul 5, 2016 4:19 AM	Scope and Bill of Quantities.
11	Jul 5, 2016 2:06 AM	date for commencement and completion. design information / client brief. budget details. head contract particulars.
12	Jul 5, 2016 12:08 AM	Project Commencement date Stakeholder information Budget Executed Contract, including special conditions Program, Scope of works and Build sequence / Build method
13	Jul 4, 2016 11:44 PM	Tender documents in their entirety (including addendums, drawings, etc.). Client / FKG relationship background. Any particular commitments made to subcontractors. Risk and Opportunity.
14	Jul 4, 2016 11:30 PM	Correct Budget and Scope of Work
15	Jul 4, 2016 11:01 PM	See above
16	Jul 4, 2016 9:33 PM	Head Contract Scope of Works Drawings Specifications Schedules Programme BOQ
17	Jul 4, 2016 9:28 PM	1. Detailed estimate 2. As much coverage as possible, especially the early trades, services and commercially high risk trades 3. Brief on exposure or known risks 4. Minimal errors!
18	Jul 4, 2016 9:10 PM	Latest documents price based on, subcontract prices, program, budget, tender correspondence.
19	Jul 4, 2016 7:03 AM	Bill of Q - detailed not Summary Scope of works What subbie or supplier quotes were received Contract details - LD's , Claim dates , Client exclusions , Agreed contract Sum Client's ability to pay , is finance approved and letter from Banker Works Program DA/BA
20	Jul 4, 2016 6:41 AM	Scope and price
21	Jul 4, 2016 6:40 AM	Main item I have found is budgets finalised for commencement. There seems to be some delay in recent projects for these to be finalised which puts more pressure on project teams to get initial trades finalised to meet program requirements

22	Jun 22, 2016 1:10 AM	* what it the correct scope - (tender docs - contract, drawings and spec) * what are the time constraints * what are the key issues with the documentation of the scope * what are lead time items identified * what is the budget * what holes in subcontractor coverage do we have
answered question		22
skipped question		1

QUESTION 6:

DOES THE ESTIMATING TEAM AT FKG GENERALLY PROVIDE ALL OF THE INFORMATION YOU HAVE LISTED ABOVE AS BEING THE MINIMUM REQUIREMENT? IF NOT, WHICH INFORMATION DO YOU FIND IS COMMONLY MISSED IN THE TRANSFER BETWEEN TEAMS?		
Number	Response Date	Response Text
1	Sep 25, 2016 6:02 AM	Yes, Generally we get everything we need
2	Sep 21, 2016 2:14 AM	YES
3	Sep 21, 2016 12:20 AM	Yes, I find that all the above is generally provided at estimating handover. Often a trade quotation hard copy folder is not provided, which I find helpful instead of locating everything electronically.
4	Sep 20, 2016 10:59 PM	Yes
5	Sep 20, 2016 10:55 PM	Fully developed construction methodology and construction program methodology / logic.
6	Sep 20, 2016 10:53 PM	Yes the estimating team generally provides the information required
7	Sep 20, 2016 10:50 PM	LIMITED KNOWLEDGE OF THIS – NEW STARTER
8	Sep 20, 2016 10:48 PM	Not really relevant to my area of FKG as we tender our won work.
9	Jul 13, 2016 10:27 PM	n/a
10	Jul 6, 2016 2:43 AM	Yes, I believe during tender most documents are usually filed well and consistently by estimating. Having access to all the information is the key. The project team still has a responsibility to familiarise themselves with the project and take control.
11	Jul 5, 2016 4:19 AM	FKG Estimating team and handover process is pretty good compared with other construction companies.
12	Jul 5, 2016 2:06 AM	yes.
13	Jul 5, 2016 12:08 AM	Yes. This is also made possible with the use of the FKG PM13 Project Commencement Checklist, which will cover what is required prior to commencement.
14	Jul 4, 2016 11:44 PM	Yes, in the ES12. BUT often the ES12 meeting is not held - I think going through it together is the key to its worth.
15	Jul 4, 2016 11:30 PM	Yes.
16	Jul 4, 2016 11:01 PM	Yes Post tender negotiation re SoW changes.
17	Jul 4, 2016 9:33 PM	Yes.
18	Jul 4, 2016 9:28 PM	Item 4 (minimal errors) has been an issue on some projects.
19	Jul 4, 2016 9:10 PM	Generally all these items are handed over.

20	Jul 4, 2016 7:03 AM	Finance Approval
21	Jul 4, 2016 6:41 AM	Yes, otherwise the estimators are not doing their job correctly
22	Jul 4, 2016 6:40 AM	Hard to say that there is a pattern on what is generally missed. If items are missed usually able to source shortly there after
23	Jun 22, 2016 1:10 AM	Generally covered. Some estimators do a better handover presentation and documentation than others
answered question		23
skipped question		0

QUESTION 7:

EQUALLY, IS THERE ANY INFORMATION OR DOCUMENTATION THAT IS OFTEN PROVIDED BY THE ESTIMATING TEAM AT FKG, BUT IS OFTEN NOT REQUIRED?		
Number	Response Date	Response Text
1	Sep 25, 2016 6:02 AM	Not really, all is usually relevant
2	Sep 21, 2016 2:14 AM	Not really
3	Sep 21, 2016 12:20 AM	The estimating handover documentation is generally very thorough, but I do not believe any of the information to be outside of what project teams require.
4	Sep 20, 2016 10:59 PM	Occasionally, this is not an issue though
5	Sep 20, 2016 10:53 PM	Sometimes the estimators code the budget into R2 codes, however this is not required as the project team do their own coding based on what we require and what we believe will be included in different trade packages, so this is an unnecessary double up.
6	Sep 20, 2016 10:50 PM	LIMITED KNOWLEDGE OF THIS – NEW STARTER
7	Sep 20, 2016 10:48 PM	Unsure
8	Jul 13, 2016 10:27 PM	n/a
9	Jul 6, 2016 2:43 AM	As above, as long as all revs of drawings, records of documents issued to subbies/ suppliers, quotes and other client documents are all available, that is my priority. I would like to note however, what drawings are selected to be sent to subbies sometimes causes issues for the project teams. I understand the fore and against for issuing all drawings vs issuing a select set to subbies, but it really does increase the liability of the project team if the subbies doesn't have access to all documents at tender time.
10	Jul 5, 2016 4:19 AM	Estimating team generally provides the whole submission package which is good. More information is always better as you never know when you need it.
11	Jul 5, 2016 2:06 AM	no. the more the merrier.
12	Jul 5, 2016 12:08 AM	No.
13	Jul 4, 2016 11:44 PM	No, it may not all be relevant to everyone involved in the project but different team members will make use of different information.
14	Jul 4, 2016 11:30 PM	Not generally. Every bit of information is important
15	Jul 4, 2016 11:01 PM	No

16	Jul 4, 2016 9:33 PM	No. Any and all information can assist.
17	Jul 4, 2016 9:28 PM	Detailed contract information is not often needed to determine price, and can be collated if we get the project.
18	Jul 4, 2016 9:10 PM	I don't believe so.
19	Jul 4, 2016 7:03 AM	NO
20	Jul 4, 2016 6:41 AM	N/ A to my projects
	answered question	20
	skipped question	3

QUESTION 8:

HOW DO YOU THINK FKG RATES WITH DOCUMENT AND INFORMATION TRANSFER, WHEN COMPARED TO INDUSTRY STANDARDS?

Answer Options	Response Percent	Response Count
World's Best / Industry Leading	13.0%	3
Satisfactory	34.8%	8
Acceptable	52.2%	12
Poor	0.0%	0
Very Poor	0.0%	0
I'd rather not say/unsure	0.0%	0
	answered question	23
	skipped question	0

QUESTION 9:

IF YOUR RESPONSE TO QUESTION 7 WAS NOT "WORLD'S BEST", PLEASE ELABORATE ON WHERE YOU THINK FKG COULD IMPROVE IN ITS DOCUMENT AND INFORMATION TRANSFER?

Number	Response Date	Response Text
1	Sep 25, 2016 6:02 AM	More information RE Methodology
2	Sep 21, 2016 2:14 AM	There are a range of programs best suited to document control which FKG could review as a potential opportunity to mitigate any loss of information handover to the construction team.
3	Sep 21, 2016 12:20 AM	My overall experience with FKG estimating handover and information transfer is that it is of a very high standard, but I have definitely never experienced "World's best" at any construction company. The meeting held between complete estimating and project teams prior to commencement is extremely professional. My only comment would be that sometimes minor items have been misplaced at handover and information packaging could be slightly improved in certain cases.
4	Sep 20, 2016 10:59 PM	Timeliness Show where quotes have been accepted in part and clarify why? Where prices have been cherry picked etc.
5	Sep 20, 2016 10:55 PM	Hold subsequent reviews of the tender documentation once the PM13 Pre-commencement Checklist has been evaluated by the construction/delivery team.

6	Sep 20, 2016 10:53 PM	Due to time constraints I believe there could always be room for improvement
7	Jul 13, 2016 10:27 PM	always room for improvement,
8	Jul 6, 2016 2:43 AM	The entire process involves people and lots of different people. People sometimes forget to file documents etc. Not a reflection of FKG, just being realistic.
9	Jul 5, 2016 2:06 AM	still using excel for transmittals and document registers and relying on email or dropbox for transfer.
10	Jul 5, 2016 12:08 AM	The transfer of information and documents has worked well for myself to date.
11	Jul 4, 2016 11:44 PM	Communication (instead of just 'here you go and let me know if you've got any questions') upon handover i.e. making sure a meeting is scheduled and all relative persons attend.
12	Jul 4, 2016 11:30 PM	Nothing is perfect and always needs improvement.
13	Jul 4, 2016 11:01 PM	Post tender negotiation re SoW changes.
14	Jul 4, 2016 9:28 PM	Quality of measure and price, again this comes down to quality of the estimator and time available to price, it will therefore differ from project to project, but is critical to a good start and opportunity to complete a profitable job.
15	Jul 4, 2016 9:10 PM	Sometimes the verbal handover can be rushed and not thorough. It is very hard with projects that have long hesitation periods to capture all of what went on in the tender period.
16	Jul 4, 2016 6:41 AM	What the final outcome should be
17	Jun 22, 2016 1:10 AM	Note here - that fact that we do not have access to the tender file across the board is not always good - better management of the electronic transfer would be good
	answered question	17
	skipped question	6

QUESTION 10:

IN AN IDEAL WORLD, HOW WOULD INFORMATION BE PRESENTED/TRANSFERRED BETWEEN ESTIMATING AND PROJECT TEAMS?		
Answer Options	Response Percent	Response Count
Face-to-face	13.0%	3
Hard Copy	0.0%	0
Soft Copy	4.3%	1
A combination	82.6%	19
Unsure	0.0%	0
	answered question	23
	skipped question	0

Appendix H – Final Estimating Survey

QUESTION 1:

Looking at the Estimating Process Flowchart, located in the Revised ESP01 Tendering Procedure, please provide a rating from 0 - 10 as to whether the processes follow a logical sequence for the management of a Tender, with 0 being "*These are completely irrelevant to a tendering process*", and 10 being "*Yes – the flow is logical and would allow efficient and effective tendering*"

QUESTION 2:

Please provide any comments relating to the rating you have provided

Preamble:

The "*ES01 - Tendering Knowledge Register*" contains several tabs (Sections) which are to be completed over the course of a tender (listed below).

A. Project Start-up
B. Estimator's Contract Review
C. Site Visit Report
D. RFI's and Addenda
E. Trade Pricing
F. Submissions
G. Post-Tender
H. Handover

Please take some time to familiarise yourself with each section, then answer the following

QUESTION 3 (PART I):

With regards to the listed sections above, please indicate their potential effectiveness (based on what is included in each form) using a scale of 0-10, with 10 being "*they appear to be very effective and I would welcome their incorporation into FKG's systems*", and 0 being "*I do not recognise a need for this form*"

QUESTION 3 (PART II):

Comments on why each section's rating was given was also requested

QUESTION 4 (PART I):

With regards to the listed sections above, please indicate the estimated time (to the closest whole hour) to complete each section.

QUESTION 4 (PART II):

Comments on why each section's rating was given was also requested.

QUESTION 5 (PART I):

In relation to the existing information-capturing and handover processes at FKG, please compare the revised system, and provide a rating out of 10, with 0 being "*Not improved at all – I don't recognise any significant improvement whatsoever*", and 10 being "*Significantly Improved - These changes should be implemented ASAP*".

QUESTION 5 (PART II):

Respondents requested to provide any further comments.

Appendix I – Final Project Teams Survey

Preamble:

The Tendering Knowledge Register has been designed so that the Estimator has a central point in which to record all their notes and captured information relating to a tender. Please take some time to review the information and tender-knowledge that is included in each section of the Tendering Knowledge Register, and answer the following:

QUESTION 1 (PART I):

Rate the importance of the information in each section out of 10, with 10 being "*this is absolutely vital*" and 0 being "*this information is not required by the project management team at project commencement*".

QUESTION 1 (PART II):

Please provide any comments relating to the rating you have provided, including any additional required information for each section.

QUESTION 2 (PART I):

Please provide a rating out of 10 relating to the presentation of tendering information and estimating knowledge in the Tender Knowledge Register, with 10 being "*The information follows a very logical sequence, allowing PM's and CA's to grasp a good understanding of the project*", and 0 being "*The information is hard to digest and would be impossible for the project team to negotiate*".

QUESTION 2 (PART II):

Please provide any comments relating to the rating you have provided.

QUESTION 3 (PART I):

When comparing the Tendering Knowledge Register with to the information you have received from the Estimating team on previous projects, please provide a rating out of 10, with 10 being "*This is a significant improvement, and should be implemented ASAP*", and 0 being "*This is not an improvement at all/! cannot see any advantage in this system*".

QUESTION 3 (PART II):

Please provide any comments relating to the rating you have provided.

Appendix J – Final Estimating Survey Results

QUESTION 1:

LOOKING AT THE ESTIMATING PROCESS FLOWCHART, LOCATED IN THE REVISED ESP01 TENDERING PROCEDURE, PLEASE PROVIDE A RATING FROM 0 - 10 AS TO WHETHER THE PROCESSES FOLLOW A LOGICAL SEQUENCE FOR THE MANAGEMENT OF A TENDER, WITH 0 BEING "THESE ARE COMPLETELY IRRELEVANT TO A TENDERING PROCESS", AND 10 BEING "YES - THE FLOW IS LOGICAL AND WOULD ALLOW EFFICIENT AND EFFECTIVE TENDERING"	
Respondent	Response Text
1	7
2	5
3	7
4	7
5	9
6	9
7	8
8	9
Average Response	7.625
answered question	8
skipped question	0

QUESTION 2:

PLEASE PROVIDE ANY COMMENTS RELATING TO THE RATING YOU HAVE PROVIDED	
Respondent	Response Text
1	This shows more of what we actually do as estimators.
2	The original Flowchart you have based your revisions on was superseded about a month ago, and the new one incorporates most of the things you have captured here.
3	Seems fairly relevant and matches processes with online system EstimateOne.
4	There seems to be a lot more work and forms for the estimator to complete particularly post tender.
5	Flow chart is more accurate and reflects what the estimating team do during tender process.
6	The proposed process appears logical and concise and generally avoids unnecessary administration.
7	The process is logical and would fit with what we currently do but I also think in an ideal world a process order is beneficial however in the heat of battle, it can also become a hindrance, depending on the situation. When I say hindrance I mean too much emphasis is placed on following a set procedure and the bigger picture could get lost or the tender becomes a half arsed attempt.
8	Estimators role (Item 6.2) is described as the Green process and decision maker. Potentially Blue and Yellow Process and Decision Makers roles should also be described (although not entirely critical to understanding the form.
answered question	8
skipped question	0

QUESTION 3 (PART I):

WITH REGARDS TO THE LISTED SECTIONS ABOVE, PLEASE INDICATE THEIR POTENTIAL EFFECTIVENESS (BASED ON WHAT IS INCLUDED IN EACH FORM) USING A SCALE OF 0-10, WITH 10 BEING "THEY APPEAR TO BE VERY EFFECTIVE AND I WOULD WELCOME THEIR INCORPORATION INTO FKG'S SYSTEMS", AND 0 BEING "I DO NOT RECOGNISE A NEED FOR THIS FORM"														
Answer Options	0	1	2	3	4	5	6	7	8	9	10	Unsure	Rating Average	Response Count
1. Project Start-up	0	0	0	0	0	2	2	0	1	2	1	0	7.25	8
2. Estimator's Contract Review	0	0	0	0	1	1	2	0	1	2	1	0	7.13	8
3. Site Visit Report	0	0	0	0	0	0	2	1	0	5	0	0	8.00	8
4. RFI's and Addenda	0	0	0	0	1	0	0	3	1	2	1	0	7.63	8
5. Trade Pricing	0	0	1	0	1	0	3	2	1	0	0	0	5.75	8
6. Submissions	0	0	1	0	0	1	2	1	2	1	0	0	6.38	8
7. Post-Tender	0	0	0	0	0	1	0	4	1	2	0	0	7.38	8
8. Handover	0	0	0	0	0	2	0	2	1	3	0	0	7.38	8
Answered Question														8
skipped question														0

QUESTION 3 (PART II):

PLEASE PROVIDE ANY COMMENTS RELATING TO THE RATING YOU HAVE PROVIDED		
Section	Respondent	Comment
1. Project Start-up	1	Good to capture all the info at start-up
	2	This Information is mostly captured in the ES00, but is good for the estimator to find. Should be called "tendering start-up"
	3	Estimating assistant already does something similar
	4	Estimating assistant can do this.
	5	could be completed by estimating assistant on behalf of estimator
	6	Nil Comment
	7	In FKG, this would not be done by the estimator. Typically done by the pre-contracts team.
	8	Possibly need reference to D and C projects and then identification of design consultants to assist FKG tender
2. Estimator's Contract Review	1	Normally we get reviews by Contracts guys
	2	Most tenders we target require a full contract review anyway
	3	Could be useful but could also be time consuming too.
	4	I already review the contact I don't really have the time to be filling in a form for something that is already communicated in tender documents.
	5	Would help estimators to be familiar with contract expectations and assist in avoiding information being missed during tender phase and causing major variations during project phase or costing the company a loss on a project because it was not picked up at tender time.
	6	Nil Comment
	7	When it comes to contracts, an Estimator is expected to have a certain level of contract knowledge but a review would be better left with a contract manager that can identify any clauses that could have adverse effects to the company should we win the project.

	8	Simple and comprehensive list of relevant contract items. Easily identifies which items need further review by Commercial Manager
3. Site Visit Report	1	Good form but I am not sure I would use it. I prefer making notes.
	2	Very good. Good info captured
	3	Easy to complete in the car after a site inspection and for hand over when someone attended on my behalf.
	4	Would be good if someone attends site on my behalf.
	5	will help with feedback both to estimating manager but also if the tender has multiply estimators, is handed over to an estimator or someone attended on behalf of the estimator.
	6	Nil Comment
	7	Very important. Not every site condition can be fully expressed on plans.
	8	Topics listed will prompt the majority of relevant site inspection items to be considered. The "Others" box can be used to capture anything else relevant.
4. RFI's and Addenda	1	Good. Would be completed by Assistant?
	2	Good Register. Easy to follow.
	3	Could be useful but might be hard to maintain.
	4	Emails are already recorded by estimating assistant does a spreadsheet really need to be created to record this. Seems time consuming however estimating assistant could update this.
	5	May be viewed as time wasting by estimators or fall on the estimating assistant to fill in because the estimators sends emails to the client and "forgets to fill in" would be good if it generated the email or information which would then be copied and pasted into an email.
	6	Nil Comment
	7	Nil Comment
	8	Nil Comment
5. Trade Pricing	1	This is ok, captures good info but would be time consuming. It's better to discuss all this info in person
	2	This is a start, but we need to review every trade in detail. This is something we are looking into more at this stage
	3	Would be interesting to give a try and see how it might improve on tendering prices and comparing subcontractors.
	4	Good for comparing prices but feels like it could be a double up of work against what is input to build soft and save electronically already.
	5	would be useful but again would the estimator actually take the time to fill this in for a tender
	6	I think a general register where the estimator identifies key risk trades and provides a brief description would suffice. Proposed format appears to complicated and therefore will not be properly used by the team. If this is to be completed pre-submission, it will take away too much time in the back end of the tender process which is already the busiest time for the estimator.
	7	I have not come across this before. I can defiantly see the benefit in it but time is a key factor here to get it reviewed and factored in time.
	8	Line 2 on the form needs to be formatted so that all of text is shown. The trade risk section will be likely a part that is often not completed due to time restrictions with workload and might not necessarily provide the desired information.
6. Submissions	1	Nil Comment
	2	This is all included by the submissions team but good for the estimator to collate in one spot
	3	May be hard to keep up to date when managing multiple tenders at once. Estimating assistant might be able to help.
	4	Is already communicated verbally and by email however estimating assistant could extract the information and fill this in.

	5	could be something that is filled in during the tender process as a way of communicating information to the submissions team prior to them creating the submission. a bit like drip feeding information during the tender process rather than an information dump right before submission
	6	Unnecessary. This should also already be clearly communicated in the tender submission? Perhaps this schedule can be used to highlight additional issues which have not been revealed in the the submission?
	7	Nil Comment
	8	Having the Methodology and Scope of works notes and the Cover Letter Qualifications/Clarifications lines for capturing proposed relevant items for the tender submission is a good idea. The fact that they are excel spreadsheet lines which will then be transferred to a MS Word document might be cumbersome.
7. Post-Tender	1	Good. Asks more relevant info to the ES12 form
	2	Nil Comment
	3	Looks like a useful too but would require input from the business managers and estimating manager during post tender negotiations.
	4	Would be useful in preparing for when a tender is won but would come down to the Estimating Manager communicating information that is discussed on behalf of the estimator and not always passed on.
	5	will help to capture information that is critical to the tender and post tender discussions which can sometimes be forgotten and not passed on accurately to project teams. May be time consuming if an estimator is trying to fill this in and complete new tenders coming in and may fall on estimating assistant to fill in.
	6	Useful to track post tender developments in a central location. In my experience this process is handled ad-hoc and results in miscommunications
	7	Nil Comment
	8	Good that form captures and summarises agreed contract and scope changes in one place.
8. Handover	1	Similar to the ES12 we have now
	2	This is ok but needs more info. Handovers are going to take a lot longer to complete well. This needs to be driven by the client's requirements. E.g. Explaining price schedules etc.
	3	Doesn't look too different to what we already have.
	4	Very similar to the hand over form we already have and would be easy to complete.
	5	clear, concise and easy to complete.
	6	Nil Comment
	7	Nil Comment
	8	Gives generalised topics for discussion and much more succinct and relevant that existing handover form

QUESTION 4 (PART I):

WITH REGARDS TO THE LISTED SECTIONS ABOVE, PLEASE INDICATE THE ESTIMATED TIME (TO THE CLOSEST WHOLE HOUR) TO COMPLETE EACH SECTION.			
Answer Options	Response Average	Response Total	Response Count
1. Project Start-up	.75	6	8
2. Estimator's Contract Review	1.38	11	8
3. Site Visit Report	.88	7	8
4. RFI's and Addenda	1.88	15	8
5. Trade Pricing (assume 10 key trades identified)	3.00	24	8
6. Submissions	1.75	14	8
7. Post-Tender	2.63	21	8
8. Handover	1.50	12	8
		answered question	8
		skipped question	0

QUESTION 4 (PART II):

RESPONDENT	TENDER KNOWLEDGE REGISTER SECTION							
	1. PROJECT START-UP	2. ESTIMATOR'S CONTRACT REVIEW	3. SITE VISIT REPORT	4. RFI'S AND ADDENDA	5. TRADE PRICING	6. SUBMISSIONS	7. POST-TENDER	8. HANDOVER
1	1	2	1	1	3	2	2	3
2	1	1	2	2	3	1	2	2
3	0	1	0	3	4	3	3	0
4	0	1	0	3	5	2	3	1
5	1	1	1	3	3	3	5	2
6	1	1	1	1	3	1	3	1
7	1	3	1	1	1	1	2	2
8	1	1	1	1	2	1	1	1
Average	0.75	1.375	0.875	1.875	3	1.75	2.625	1.5
* Assuming 10 Key Trades					Total (Sum Averages)			13.75

QUESTION 5 (PART I):

IN RELATION TO THE EXISTING INFORMATION-CAPTURING AND HANDOVER PROCESSES AT FKG, PLEASE COMPARE THE REVISED SYSTEM, AND PROVIDE A RATING OUT OF 10, WITH 0 BEING "NOT IMPROVED AT ALL - I DON'T RECOGNISE ANY SIGNIFICANT IMPROVEMENT WHATSOEVER", AND 10 BEING "SIGNIFICANTLY IMPROVED - THESE CHANGES SHOULD BE IMPLEMENTED ASAP".													
Answer Options	0	1	2	3	4	5	6	7	8	9	10	Rating Average	Response Count
1. Project Start-up	1	0	0	0	1	1	1	2	0	1	0	4.75	8
2. Estimator's Contract Review	0	0	1	0	0	1	2	1	0	1	1	5.63	8
3. Site Visit Report	0	0	0	1	0	1	1	1	2	2	0	6.88	8
4. RFI's and Addenda	0	0	0	1	0	2	1	2	1	1	0	6.25	8
5. Trade Pricing	0	1	1	0	0	2	1	1	0	2	0	5.50	8
6. Submissions	0	0	1	0	2	1	1	1	0	2	0	5.75	8
7. Post-Tender	0	0	0	1	0	1	1	1	2	2	0	6.88	8
8. Handover	0	1	1	0	0	0	1	3	1	1	0	5.88	8
Please provide any comments relating to the rating you have provided													4
answered question													8
skipped question													0

QUESTION 5 (PART II):

NUMBER	PLEASE PROVIDE ANY COMMENTS RELATING TO THE RATING YOU HAVE PROVIDED	
1	As Per my previous comments.	
2	People are reluctant for change.	
3	Item 1 and 2 is currently done by another department.	
4	Having all of the sections/topics in one combined form is good rather than lots of separate forms. This will mean that the form will be more likely to be completed in an ongoing way throughout the tender and post tender process.	
answered question		*4*
skipped question		*4*

Appendix K – Final Project Teams Survey Results

QUESTION 1 (PART I):

`RATE THE IMPORTANCE OF THE INFORMATION IN EACH SECTION OUT OF 10, WITH 10 BEING "THIS IS ABSOLUTELY VITAL" AND 0 BEING "THIS INFORMATION IS NOT REQUIRED BY THE PROJECT MANAGEMENT TEAM AT PROJECT COMMENCEMENT"													
Answer Options													
1. Project Start-up	0	1	2	3	4	5	6	7	8	9	10	Rating Average	Response Count
2. Estimator's Contract Review	0	0	0	2	1	0	0	1	4	6	5	8.05	19
3. Site Visit Report	0	1	0	0	1	1	2	2	2	6	4	7.68	19
4. RFI's and Addenda	0	1	0	0	1	3	2	1	8	2	1	6.89	19
5. Trade Pricing	0	0	0	0	0	1	3	2	3	4	6	8.26	19
6. Submissions	0	1	0	0	1	1	0	4	3	3	6	7.84	19
7. Post-Tender	0	0	0	0	0	1	4	3	5	4	2	7.68	19
8. Handover	0	1	0	0	1	0	3	1	5	5	3	7.63	19
	0	1	1	0	0	2	0	2	1	6	5	7.32	19
Answered Question													19
Skipped Question													0

QUESTION 1 (PART II):

SECTION	NUMBER	COMMENT
1. Project Start-up	1	A lot of the information throughout this section, although extremely important from an estimating standpoint becomes redundant on project commencement. Adding quick reference fields such as project duration and critical dates to the project particulars would help improve its relevance after handover.
	2	Establish the project as if the tender has already been awarded to you. Starting with half the information will reflect on the quality of the estimate and the estimator's commitment through-out the tender period.
	3	Not too relevant to project handover but could be useful for a quick review.
	4	My division does not utilise this component.
	5	Critical that client and superintendent contact details are known at commencement.
	6	Any Opportunities and Risks need to be highlighted here so they can be addressed at the earliest opportunity.
	7	Some of the details to be recorded in this section are important to have prior to commencement such as provisional sums, commencement date, address, permits and approval statuses.
	8	Some items vital for the estimator, not project team, regardless VIP.
	9	Nil Comment
	10	It must be very important to give the project teams as much help and knowledge before the embark on a job. Why wouldn't it be anything other than a 10!
	11	There are few FKG's Forms that capture similar information when filled out by the Estimator and provided to the Project team at the project commencement/handover. You might have seen ES05, ES08, ES09, ES12
	12	Nil Comment
	13	Nil Comment
2. Estim	1	Nil Comment

	2	To understand the risk associated with the contract and to ensure estimate reflect the level of risk associated.
	3	Could be useful and could be refilled out once tender is won for a comparison on changes between tender and project.
	4	My division does not utilise this component.
	5	Some important information included here, but not critical to commencement.
	6	Site Team will conduct their own review so they can understand the Contract.
	7	Works should not start until the contract is executed and there is a full understanding of same.
	8	1) Can you use drop down boxes in some sections to avoid typing? i.e. retention values often percentage? 2) Insurances repeats quite a bit, does this follow a specific contract? i.e. lines 22,27,28,31 3)Line 34 development approvals is normally a tender condition, not a contract condition? Did you see this in a specific contract?
	9	Nil Comment
	10	It's always handy to have a Contract review carried out before starting on site but the site team should be carrying out their own review of the contract anyway and not relying on others.
	11	Nil Comment
	12	You could list the design consultants here as well, and at what stage the tender documents are detailed to - concept/schematic, for construction, BA approved, etc. Is there a reference to the tender documents provided by the Principal to form the scope for the tender?
	13	Nil Comment
3. Site Visit Report	1	Although all of this information is important at commencement, is it reasonable to expect an estimator to obtain it during a site visit. Adding to site notes section relating to the availability of temporary power, water and amenities on site would be of benefit. Demolition should also be expanding to include items such as the extent of structural demolition and removal for reuse items would also help.
	2	Pending the type of project - Greenfield site inspection (5) by the estimator is less important than for a refurbishment (8). Project team will look at it but will generally do their own.
	3	Could be useful for when the site is being reviewed in preparation for project phase.
	4	My division does not utilise this component.
	5	Very important if the job is not easily accessible to project team, otherwise preference is to actual visit site in person.
	6	Can contain information detailing potential latent conditions, working hour restrictions, access restrictions etc. that can affect you once on site.
	7	Some sections of this seem important such as disposal locations as first activities could be demolition. Other details regarding prone to flooding or site access could be handy for setting up site sheds and temporary facilities.
	8	1) Can competitors at inspection be reduced to one line? 2) what's PKF folder? FKG? 3) line 41, ask if there's an asbestos register.
	9	Nil Comment
	10	There are some key things that come out of a site visit that the project team should be made aware of. Having said that, going to have a look yourself is the best way.
	11	Please also refer to ES05 Site Visit Report Form on The Store
	12	Add reference to available soil report, geotech investigations, nature of foundations for adjacent buildings etc.

	13	Nil Comment
4. RFI's and Addenda	1	Nil Comment
	2	Most tender doc sets are not updated and Addenda form a critical base for the hand-over.
	3	Would help to be able to see what questions were raised during tender phase and if they have been clarified enough for project or if further clarification needs to be sort. Would be a useful too.
	4	During Tender stage this is saved in the tender folder
	5	Important if changes included in our scope that team needs to be made aware of.
	6	It's extremely important to know any key questions already asked and the final documentation that sometimes sneaks its way into our Contract which can catch us out.
	7	This information is important however not vital to enable commencement.
	8	Nil Comment
	9	Nil Comment
	10	Generally, the most important thing is that the estimator can verify that the contract is based on the answers to the RFIs and that the for construction drawings have been updated to encompass the responses during the tender period. Loose ends are important to know about.
	11	Please also see ES02 Quotation Request / Addendum
	12	Nil Comment
	13	Nil Comment
5. Trade Pricing	1	Good. Preliminaries section should probably be expanded as it is quite limited as stands.
	2	Nil Comment
	3	May provide assistance when reviewing quotations and then putting the project out for contact and help to review project price risks.
	4	My division does not utilise this component.
	5	Very important for early trades that need to be procured to start works on site.
	6	Great to have as you can retender to the same trades during construction. Where there's no pricing accurate estimating is a must.
	7	Trade letting needs to occur prior to site commencement and these details are required for trade letting.
	8	1) Is risk pricing % really required? Surely a prioritised list with comments would create the same result without additional work required? 2) Is a report showing what prelims allowed required? Doesn't the budget do the same thing?
	9	Nil Comment
	10	Generally the site team go and re tender the packages but to know where "screamers" have been used and where we don't have much coverage is very important.
	11	Please also refer ES10 Subcontractor Prequalification Questionnaire
	12	Good structure on assessment of risk in trade pricing. Another form of risk identification could be the bill of quantities - guaranteed by the client, determined by FKG, or S/C lump sum tender pricing.
	13	Need a good spread, number of prices
6. Submissions	1	Nil Comment
	2	Nice to have
	3	Nil Comment
	4	When needed we use submission team and it works well

	5	Critical that tendered methodology is understood prior to planning and commencing works.
	6	Again we just need to know what our company has offered up to get the deal done within the submission.
	7	Existing methodology needs to be considered by the project delivery team from day one to either take on board or tweak for the works.
	8	1) handy recording tool for estimators but not critical information for handover as it will be included in tender submission.
	9	Nil Comment
	10	Always good to get the highlights of the submission and why we won the job. Better this than going in blind.
	11	Nil Comment
	12	Very important to list/identify if there is a specific format of response required by the tender document.
	13	Nil Comment
7. Post-Tender	1	Nil Comment
	2	This is the biggest noncompliance area currently within this organisation as the estimator is in most cases not involved in all this horse trading discussions.
	3	Will help in preparing project should any issues be raised that were discusses during post tender discussions that may need to be raised with the client.
	4	My division does not utilise this component.
	5	Not as important for actual project commencement.
	6	Nil Comment
	7	Any deals done by the estimating department must be advised to the follow on people.
	8	Nil Comment
	9	Nil Comment
	10	The negotiations post tender are very important as this is where we have to compromise to win a job and all previous submissions are overridden.
	11	ES12 Tender, Contract and Opportunity Review (AS2124-1992)
	12	Nil Comment
	13	Nil Comment
8. Handover	1	Nil Comment
	2	Should all the above be 100% complete project team should be able to proceed without a detailed handover
	3	Fairly similar to what is already in use.
	4	My division does not utilise this component.
	5	Of least importance to project commencement.
	6	Every piece of information is essential in building a platform for the site team and giving them the best chance at success.
	7	This encompasses all the previous sections to at least talk about them and probably better gauge how important that information is prior to commencement.
	8	Nil Comment
	9	As well as the hardcopy it is important that the latest set of docs (after addenda and post tender) are in a clear and concise location, not have to troll through all the addenda and post tender documents to figure out the latest. Project teams do not have the time at the start to do this and it can mean things are missed in early letting.
	10	It's very important that this process is not rushed and that it is thorough, so as to give the project team a great start.
	11	Generally this form (ES12 Tender, Contract and Opportunity Review (AS2124-1992)) is used at the handover from the estimator to the project
	12	Nil Comment

	13	Nil Comment
Answered Question		13
Skipped Question		6

QUESTION 2 (PART I):

PLEASE PROVIDE A RATING OUT OF 10 RELATING TO THE PRESENTATION OF TENDERING INFORMATION AND ESTIMATING KNOWLEDGE IN THE TENDER KNOWLEDGE REGISTER, WITH 10 BEING "THE INFORMATION FOLLOWS A VERY LOGICAL SEQUENCE, ALLOWING PM'S AND CA'S TO GRASP A GOOD UNDERSTANDING OF THE PROJECT", AND 0 BEING "THE INFORMATION IS HARD TO DIGEST AND WOULD BE IMPOSSIBLE FOR THE PROJECT TEAM TO NEGOTIATE"													
Answer Options	0	1	2	3	4	5	6	7	8	9	10	Rating Average	Response Count
1. Project Start-up	0	1	0	0	0	0	0	2	7	6	3	8.16	19
2. Estimator's Contract Review	0	1	0	0	0	0	1	2	7	6	2	7.95	19
3. Site Visit Report	0	1	0	0	1	0	1	3	7	3	3	7.63	19
4. RFI's and Addenda	0	1	0	0	0	0	0	1	12	3	2	7.95	19
5. Trade Pricing	0	1	0	0	0	0	1	1	9	4	3	8.00	19
6. Submissions	0	1	0	0	0	1	2	1	8	3	2	7.16	19
7. Post-Tender	0	1	0	0	0	0	1	4	7	4	2	7.74	19
8. Handover	0	1	0	0	0	1	1	2	7	4	3	7.79	19
Answered Question													19
Skipped Question													0

QUESTION 2 (PART II):

	NUMBER	RESPONSE DATE
1. Project Start-up	1	Nil Response
	2	My division does not utilise this component.
	3	Nil Response
	4	Nil Response
	5	Nil Response
2. Estimator's Contract Review	1	Nil Response
	2	My division does not utilise this component.
	3	Nil Response
	4	Nil Response
	5	Nil Response
3. Site Visit Report	1	Is competitors the most important information obtained at a site visit, or could it be listed further down with sub-contractors. Site Notes and access should be first, the rest of the information can be searched for as required.
	2	My division does not utilise this component.
	3	Site address is a double up of Project Start-up information. Also there is a reference "Link to PKF Photos Folder"... not sure what PKF stands for?
	4	Nil Response
	5	Nil Response

4. RFI's and Addenda	1	Nil Response
	2	My division does not utilise this component.
	3	Nil Response
	4	Nil Response
	5	Nil Response
5. Trade Pricing	1	Good, shift your example to the right of the instructions and go straight into your pricing. If someone wants an explanation of how you found your risk levels they go back up and look but under most circumstance, they just want to see the Figures.
	2	My division does not utilise this component.
	3	Must focus on this section if a trade subcontractors price submission has been used for the budget with particular detail review of their allowances and departures as most times they have excluded something and additional budget has not been allowed.
	4	Nil Response
	5	Nil Response
6. Submissions	1	Nil Response
	2	My division does not utilise this component.
	3	Program information needs to be presented within this section somehow
	4	Nil Response
	5	Nil Response
7. Post-Tender	1	Nil Response
	2	My division does not utilise this component.
	3	Nil Response
	4	Should relationships be elsewhere, why post tender?
	5	Nil Response
8. Handover	1	Nil Response
	2	My division does not utilise this component.
	3	There should be a section for overall estimators summary
	4	Nil Response
	5	What happened to using the ES12?
answered question		5
skipped question		14

Question 3 (Part I):

SECTION	RESPONDENT	PLEASE PROVIDE ANY COMMENTS RELATING TO THE RATING YOU HAVE PROVIDED
1. Project Start-up	1	For all these sections, the information provided isn't really new. But the ease of access and the convenience of it all being stored in the one location is a definite improvement.
	2	Nil Comment
	3	Estimating team already complete something similar but is not really handed over at tender time.
	4	very similar to what is already handed over.
	5	My division does not utilise this component.
	6	Nil Comment
	7	As noted above currently there are various FKG's forms that capture the similar information.

2. Estimator's Contract Review	1	Nil Comment
	2	Nil Comment
	3	I do not believe the estimators do any formal written review at tender phase.
	4	Nil Comment
	5	My division does not utilise this component.
	6	Nil Comment
	7	Nil Comment
3. Site Visit Report	1	Nil Comment
	2	Nil Comment
	3	Could be useful as there are often emails sent but nothing formally recorded.
	4	Nil Comment
	5	My division does not utilise this component.
	6	nothing received previously, just a discussion
	7	Nil Comment
4. RFI's and Addenda	1	Nil Comment
	2	Nil Comment
	3	Nil Comment
	4	Nil Comment
	5	My division does not utilise this component.
	6	summarised well.
	7	Nil Comment
5. Trade Pricing	1	Nil Comment
	2	Nil Comment
	3	Would be interesting to see if estimators complete this and how it compares to what is input into buildsoft and comparing it to quotations provided.
	4	will estimators actually take the time to complete this or just hand over hard copies of quotes and emails and by pass filling this out.
	5	My division does not utilise this component.
	6	Nil Comment
	7	Nil Comment
6. Submissions	1	Nil Comment
	2	Nil Comment
	3	Nil Comment
	4	Nil Comment
	5	My division does not utilise this component.
	6	Nil Comment
	7	Nil Comment
7. Post-Tender	1	Nil Comment
	2	Nil Comment
	3	Would be a big improvement and help to be informed on post tender discussions.
	4	Nil Comment
	5	My division does not utilise this component.
	6	Nil Comment
	7	Nil Comment

8. Handover	1	Nil Comment
	2	This is a duplication of over existing forms that provide more relevant information for the project team. I believe form will assist the estimator formatting his handover.
	3	Similar to current form.
	4	similar to what we already have.
	5	My division does not utilise this component.
	6	Nil Comment
	7	Nil Comment
answered question		7
skipped question		12

Appendix L – Tender Knowledge Register

Section 0 – Instructions:

ES01 - Tender Knowledge Register	
Purpose	The purpose of this document is to file the information and knowledge that is gained by the Estimating team over the course of a tender. The aim is to capture as much tender/project knowledge as possible, as it is vital for the commencement of a project, but additionally holds value for the pricing of future tenders. This form also provides for the transfer of that knowledge and information to the project team upon tender completion.
Format	This documented is formatted as a multi-tab, linked excel spreadsheet. The linking of tabs ensures that if information is included in more than one area, it is required to be entered once only. Linked cells are highlighted blue
Instructions	The table below provides a sequence as to when each tab is to be completed, and nominates the required person to complete it.
PLEASE NOTE	Throughout the document, several worked examples (of information required) are provided. These are for information -only, and are highlighted in green and may be deleted by the estimator upon commencement of the tender.

Summary of TKR processes & responsibilities		
ES01-1. Project Start-up	Complete as soon as possible after tender has been assigned	Estimator
ES01-2. Estimator's Contract Review	Complete as soon as possible after tender has been assigned	Estimator
ES01-3. Site Visit Report	Complete whilst attending, or directly after attending site inspection (if applicable)	Estimator
ES01-4. RFI's & Addenda	Complete as RFI's are issued or Addenda Received.	Estimator (RFI's) & Assistant (Addenda)
ES01-5. Trade Pricing	Complete as key trades/risk trades pricing is finalised.	Estimator
ES01-6. Submissions	Complete over the course of the tender, as scope/methodology notes are developed, and qualifications/clarifications identified.	Estimator
ES01-7. Post-Tender	Complete upon tender completion, during negotiations.	Estimator
ES01-8. Handover	Complete upon tender completion, in preparation for handover meeting. Meeting minutes to be completed during meeting.	Estimator & Assistant
ES02 Subcontractor Summary (referred to in ES01-8)	Export as soon as tender is completed	Assistant
ES03 Document List (referred to in ES01-8)	Export as soon as tender is completed	Assistant

Section 1 – Project Start-up Sheet:

1. Project Start-Up		
(To be completed by Estimator once tender has been assigned).		
TENDER PARTICULARS		
Tender Name		
Tender Number		
Closing Date & Time		
Submission Format		
Location of Submission (physical address or URL for e-tenders)		
Estimator		
Tender Principal	Name	
	Contact Number	
	Email	
Tender Superintendent	Name	
	Contact Number	
	Email	
Tender Validity Period		
Competition		
Nominated Provisional Sums		
Nominated Consultants Fees		
General Comment as to the quality of tender documents		
PROJECT PARTICULARS		
Commencement Date		
Site Address		
Key Trades		
Site Visit Required?		
Site Visit Date		
Special permits, consents, approvals required for the project?		
Is QLEAVE paid by FKG or Client?		
Approval status (DA, BA, Etc.)		
SUBMISSIONS PARTICULARS:		
Submissions Manager		
Program Required?		
Programmer Nominated	Name	
	Contact Number	
	Email	
Cash flow Chart Required?		
Nominated Subcontractors?		
Client Pricing Schedule Required?		
Separable portion pricing required?		

Section 2 – Estimator's Contract Review:

2. Estimator's Contract Review

DETAILED INSTRUCTIONS	Complete upon assignment of tender to Estimator. Estimator's contract review to be provided to		
Contract Section	**Tender Comment**	**Summary of FKG Preference (Full Contract Review Contains full list of FKG preferences)**	**Detailed Review Required?**
Preliminaries			
Tender Principal	**Cell Linked to Project Start-Up***	N/A - List Contract Information Only	
Contract with Principal/Head Contractor?			
Correct FKG Entity to Utilise			
Overall Scope of Work (limit to one sentence)			
Commencement in contract	**Cell Linked to Project Start-Up***		
Anticipated Completion Date (in contract)			
Project Location Particulars/State	**Cell Linked to Project Start-Up***		
Provisional Sums	**Cell Linked to Project Start-Up***		
Separable Portions	**Cell Linked to Project Start-Up***		
Annexure Part A- General Conditions of Contract			
Nature of Contract (Contractor, Subcontractor, Supply, Hire, etc.)		N/A - List Contract Information Only	
Security/Retention to be held		Total security to be no more than 5% of the contract sum. Preferred form of security is insurance bonds.	
Percentage reduction to Security/Retention		Total security after practical completion not to exceed 2.5% of the contract sum.	
Undertakings		Undertakings and insurance bonds to have an expiry date consistent with contract release date (e.g. practical completion, expiry of defects liability period).	
Subcontracting		N/A - List Contract Information Only	
Latent Conditions		Entitlement to both time and cost for latent conditions.	
Special permits, consents, approvals required for the project?		N/A - List Contract Information Only	
Indemnities		Indemnities to be limited to: negligence; damage to property; and personal injury or death.	
Suspension/Stand-down		FKG Entitled to claim	
		FKG Entitled to claim	
Extensions of Time		An entitlement to an extension of time and cost for all delays caused by the Principal. Extension of time for neutral events, such as: weather; industrial conditions; latent conditions; acts of public authorities; changes in law; cultural heritage/native title; and force majeure. Any time bar should commence from the time when FKG became aware of the delay. Period of notice should be not less than 14 days.	
Liquidated damages		General damages not to apply in addition to liquidated damages. Total liability for liquidated damages to be capped at 10% of the contract sum. Amount of liquidated damages to be no more than 0.1% of the contract sum per day.	
General Damages		Liability to be capped to the value of insurance or, where claim is not insurable, to 50% of the contract sum.	
Consequential Damages		No liability for consequential damages.	
Defect Liability Period		Defects liability period to be no more than 12 months after the date of practical completion.	
Warranties		Preferable for warranty to be obtained directly from the supplier or manufacturer.	
Insurance Requirements		N/A - List Contract Information Only	
Variations		N/A - List Contract Information Only	

Certificates, Payment Claims, Time for Payment		Payments to be certified by an independent party. Payment terms to be no less than 28 days. Transfer of title to goods to only occur upon payment for goods.	
Development Approvals		Principal to obtain all approvals and permits.	
Cancellation Costs		Termination for convenience must include payment for cancellation costs to suppliers and subcontractors and demobilisation costs.	
Intellectual Property		FKG provides a license to the Principal for any IP created in the course of the project.	
Annexure Part B – Special Conditions Amending the General Conditions			
List Condition		Estimating Manager to Review.	
List Condition		Estimating Manager to Review.	
List Condition		Estimating Manager to Review.	
List Condition		Estimating Manager to Review.	

Section 3 – Site Visit Report:

3. Site Inspection Report			
DETAILED INSTRUCTIONS:	Site inspection report is to be completed **while on site** to ensure that the maximum amount of information is obtained. The Report is a guideline only, with any additional site notes to be incorporated in "Other Site Notes".		
GENERAL			
Site Visit Date	**Cell Linked to Project Start-Up***	Time:	
Competition at Site Inspection - NOTE: If more than 5 competitors are present at site, note in "Other Site Notes" and inform Business Unit Manager for review.	Competitor 1		
	Competitor 2		
	Competitor 3		
	Competitor 4		
	Competitor 5		
Client/Superintendent Representative(s) On Site			
Representative 1	Name		
	Contact Number		
	Email		
Representative 2 (if applicable)	Name		
	Contact Number		
	Email		
Representative 3 (if applicable)	Name		
	Contact Number		
	Email		
Site Address			
Nearest town (remote sites only)			
Distance from Site		**Km**	
Local Authority			
PHOTOS			
Link to PKF Photos Folder:			
COUNCIL SERVICES			
	Details of Local Tips	Distance	Tipping Charge
Disposal of Soil			
Waste Depots			
Concrete			
SITE NOTES			
Topography, existing flora & fauna, water			
Is site prone to flooding? Are there mitigation measures in place?			
Existing structures on site (potential for use as site sheds?)			
Weather Conditions (at inspection date)			
Are Meteorological Reports available?			
DEMOLITION			
Do existing buildings contain asbestos?		Report issued?	
Is any shoring or underpinning required to adjacent buildings?			
If so, provide details or suggestions			
SITE ACCESS			

Existing Roads On Site	Condition?		
	Capacity?		
	Width?		
Existing Roads Adjacent Site	Condition?		
	Capacity?		
	Width?		
Access Difficulties?			
Temporary roads Required?			
GROUND CONDITIONS OBSERVED			
Extent of adverse climatic conditions on site operations			
Surface Water witnessed (Yes/No)			
Existing foundations, rock, or other material expected to be found during excavation			
Any other ground details			
LOCAL SERVICES & UTILITIES			
	Existing	Authority	
Main Drainage			
Water			
Telephone			
Gas			
Electricity			
	Voltage		
Closest amenities / shops			
SECURITY			
Is site fenced? (Y/N)		Lineal Metres	
Will Temp Fence be required?			
Will Hoarding be required?			
Site Security (watchmen) Required?			
SUBCONTRACTORS AND LABOUR			
Subcontractors at site inspection?	Name	Contact Number	Trade
Subcontractor 1:			
Subcontractor 2:			
Subcontractor 3:			
Subcontractor 4:			
Subcontractor 5:			
Subcontractors identified locally (e.g.. Working on nearby sites, or based in same town).			
Any other major work occurring locally?			
Trades identified on site which will be key for project commencement.			
Are there labour rates/living away allowances to be considered, due to the project location? (Y/N)			
Quality or expected output of local labour			
Local Trade Union organisation			
OTHER			
Any HC documentation provided on site? (RFI to be issued for electronic copy also)			
Other site notes:			

Section 4 – RFI's and Addenda:

4. RFI & Addenda Register

DETAILED INSTRUCTIONS:	Estimator to complete register as RFI's are submitted, with Estimating Assistant completing Tender Addendums register as they are received. Information summary to be provided to Project Team at Project Handover.

Requests For Information

Tender Name:	**Cell Linked to Project Start-Up***	Tender No.	**Cell Linked to Project Start-Up***		
RFI No.	Breif Description	Date Submitted	Reply Req'd Date	Reply Rec'd Date	Client Ref. (Addendum No.)
047	Missing Architectural plan A107-A109	13/10/2016	17/10/2016	18/10/2016	003
...	*Insert more lines as required*				

Tender Addendums

Addendum No.	Breif Description	Date Received	Sent to Subbies? (Y/N)	EOT Ref (If Applicable)?	RFI Ref (If Applicable)?
003	Missing plans issued	18/10/2016	YES	N/A	047
...	*Insert more lines as required*				

Section 5 – Pricing:

5. Pricing	
INSTRUCTIONS:	It is recommended that Pricing Risk Assessment be conducted upon completion of each trade pricing. The
	Key Trade: Names of key trades identified by Estimator at project start-up, or noteworthy trades identified during tender pricing
	Selected Subcontractor: Enter subcontractor/s applicable to trade
	Subcontract price & 2nd place price (COMPLETED POST-TENDER): These are entered to calculate risk in subcontractor pricing. These figures **DO NOT** have to be completed until project handover. Both percentage risk and risk value will be calculated automatically.
	Trade Risk (COMPLETED POST-TENDER): Using FKG's indicative risk table (right), evaluate trade risk.
	Rated Items: Any high-value items which have had rates applied. Brief description of what and why.
	Comment: General trade comments, including but not limited to: Trade coverage, Pricing risk percentage
	Preliminaries (COMPLETED POST-TENDER): Preliminaries table to be completed, with as many sections completed as possible
S/C Risk Level	**Criteria**
Low	· Minor finishing trades such as landscaping, floor covering
	· Any high risk activity is limited in scope (usually Has Subs or mobile plant) and frequency controlled
	· Where the subcontractor has a high level of commitment and understanding of workplace health & safety objectives
Medium	· Trades where the particulars of the subcontract do not significantly expose the contractor to high risk
	· Where the subcontractor shows some evidence of commitment the management of EHS impacts and risks
High	· Predominately high risk activities / occupations undertaken including Working at Heights (i.e. roofing,
	· Subcontractors which are not exposed to high risk activities but whose safety performance is unknown or suspected to require further scrutiny through monitoring or document submittal
	· Where the subcontractor shows low commitment to, or ability to implement measures to control workplace health and safety

Price risk as a percentage of trade value:

$$Risk\ Percentage\ (\%) = \frac{(2^{nd}\ place\ quote\ value - 1^{st}\ place\ quote\ value)}{1^{st}\ place\ quote\ value} \times 100$$

$$Risk\ Value\ (\$) = 2^{nd}\ place\ subcontractor\ value\ - 1^{st}\ place\ subcontractor\ value$$

EXAMPLE TABLE:		Risk Percentage (%)	Risk Value ($)
Trade	Structural Steel	5.82%	$ 5,500.00
Selected Subby	ABC Rigging & Steel		
Trade Risk (Refer Risk Table)	Medium to High		
Subcontract price (including rates items)	$94,500.00		
2nd Place subcontract price (including rated items)	$100,000.00		
Rated Items	**Bollards** rated based on Rawlinson's guide - No quotes		
Trade Comments/Scope Comments/Opportunities	Good coverage. Quotes all had similar total tonnage. Price includes supply & erection		

Preliminaries			
Preliminary Allowances			
Total Weeks Allowed in pricing			
	YES / NO	**Quantity or Value ($)**	**Weeks Duration**
Project Manager			
Contracts Admin			
Cadet Admin			
Site Manager			
Structures Foreman			
Finishes Foreman			
Site Engineer			
Tradesman			

Labourer			
Apprentice			
Temp Fence/hoarding (m)			
Craneage Allowance			
Scaffolding Allowance			
Site Offices & Facilities			
Temporary Services			
Insurances & Fees			
Public Liability Insurance			N/A
Contractor's All-Risk insurance			N/A
QLEAVE			N/A

Other Notes Relating to Project Preliminary Allowances / Overheads?

Pricing & SC Risk

KEY TRADE 1		Risk Percentage (%)	Risk Value ($)
Trade		#DIV/0!	$ -
Selected Subby			
Trade Risk (Refer Risk Table)			
Subcontract price (including rates items)	$0.00		
2nd Place subcontract price (including rated items)	$0.00		
Rated Items			
Trade Comments / Scope Comments/opportunities			

KEY TRADE 2		Risk Percentage (%)	Risk Value ($)
Trade		#DIV/0!	$ -
Selected Subby			
Trade Risk (Refer Risk Table)			
Subcontract price (including rates items)	$0.00		
2nd Place subcontract price (including rated items)	$0.00		
Rated Items			
Trade Comments / Scope Comments/opportunities			

KEY TRADE 3		Risk Percentage (%)	Risk Value ($)
Trade		#DIV/0!	$ -
Selected Subby			
Trade Risk (Refer Risk Table)			
Subcontract price (including rates items)	$0.00		
2nd Place subcontract price (including rated items)	$0.00		
Rated Items			
Trade Comments / Scope Comments/opportunities			

KEY TRADE 4		Risk Percentage (%)	Risk Value ($)
Trade		#DIV/0!	$ -
Selected Subby			
Trade Risk (Refer Risk Table)			
Subcontract price (including rates items)	$0.00		
2nd Place subcontract price (including rated items)	$0.00		
Rated Items			
Trade Comments / Scope Comments/opportunities			

KEY TRADE 5		Risk Percentage (%)	Risk Value ($)
Trade		#DIV/0!	$ -
Selected Subby			
Trade Risk (Refer Risk Table)			
Subcontract price (including rates items)	$0.00		

2nd Place subcontract price (including rated items)	$0.00		
Rated Items			
Trade Comments / Scope Comments/opportunities			

KEY TRADE... *INSERT MORE LINES AS REQUIRED***		Risk Percentage (%)	Risk Value ($)
Trade		#DIV/0!	$ -
Selected Subby			
Trade Risk (Refer Risk Table)			
Subcontract price (including rates items)	$0.00		
2nd Place subcontract price (including rated items)	$0.00		
Rated Items			
Trade Comments / Scope Comments/opportunities			

Section 6 – Submissions:

6. Submissions	
DETAILED INSTRUCTIONS:	Estimator to make notes for inclusion in Tender Submission Methodology, as well as qualifications/clarifications for inclusion in Tender Submission covering letter
Methodology / Scope of Works Notes	
001	
002	
003	
004	
005	
006	
007	
008	
009	
010	
011	
012	
013	
014	
015	
...	*Insert more lines as required*
Covering Letter Qualifications / Clarifications	
001	
002	
003	
004	
005	
006	
007	
008	
009	
010	
011	
012	
013	
014	
015	
...	*Insert more lines as required*

Section 7 – Post-Tender:

7. Post-Tender

Project particulars (only to be modified if changed from original tender information)			
Start Date	**Cell Linked to Project Start-Up***		
Anticipated Completion	**Cell Linked to Project Start-Up***		
Approval Status	**Cell Linked to Project Start-Up***		
Contractual Negotiations (only to be completed if contract has changed)			
Clause Number	**Description**	**Original Condition**	**Revised Condition**
E.g. 2.11	Liquidated Damages	$1000 Per day, unlimited	$1000 per day, capped at 10% contract value
Tender Clarifications			
Clarification Number	**Clarification Description**	**Negotiated final outcome**	**Notes**
E.G. 003	Included non-specified product due to lead times	Client Agreed	Negotiated cap on LD's to 10% as per FKG's preference.
Pricing			
Submitted Tender Price			
Negotiated Contract Price			
***If different, provide brief summary of changes**			
Provide summary of post-tender documentation changes:	**Document Number**	**Changes**	**Affect on Contract Price**
	A115 - External Pavement Layout Plan	Revised Rev B - Change concrete from grey to coloured	Work to be included in VPR001 - tender to construction changes. Not yet priced.
Relationships			
How is FKG's current relationship with Superintendent? Provide brief description.			
How is FKG's current relationship with Client? Provide brief description.			
Are RFI's and correspondence response times acceptable (Y/N)?			

If Not, provide description of response times:		
Has FKG made any binding nominations for project staff in Submission (Y/N)?		
If so, please list:	**Name**	**Role**
Subcontractor Summary		
Estimating Assistant to export & save EstimateOne subcontractor summary (as at completion of tender). File to be included in Tender Folder,		
File Name	ES02_T1234_EXAMPLE TENDER_SUBCONTRACTOR SUMMARY	
File Location	J:\TENDERS\2016 TENDERS\T1234 EXAMPLE TENDER\SUBCONTRACTORS	
Document Matrix / Register		
Estimating Assistant to export & save EstimateOne document matrix (detailing which trades were sent which tender documents (as at		
File Name	ES03_T1234_EXAMPLE TENDER_DOCUMENT MATRIX	
File Location	J:\TENDERS\2016 TENDERS\T1234 EXAMPLE TENDER\DRAWINGS & SPECIFICATIONS	

Section 8 – Handover:

8. Handover Guidelines and Meeting Minutes			
Instructions / Overview	The purpose of this document is to provide an outline of the expected project knowledge and information to be transferred to the Project Team from Estimating. It provides an outline of the presentation of the knowledge and information, as well as a guideline for the handover meeting schedule. Finally it provides a facility for the recording of the handover meeting minutes.		
Documentation Checklist (Mark Received information with "X")			
Information Received?	**Document Name**	**Document Format**	
	Tender Knowledge File	.xlsx & Hard Copy Printed	
	Subcontractor & Document Matrix Summaries	PDF	
	FKG Contract Review (optional - refer ES01 section 2)	Hard Copy Printed	
	Programme (Optional - Refer ES01 section 1), as included in tender submission	Hard Copy & PDF	
	Full copy of tender submission	PDF	
	Tender Quotes	Hard Copy	
	Tender Plans - Key overview plans	Hard Copy	
	Tender Plans - Full Set	PDF	
	Tender Bill of Quantities Summary	Hard Copy	
	Tender Bill of Quantities	PDF	
Meeting Agenda			
Tender Area	**Topic for discussion**		
1. Project Start-up	Tender/Project/Submission Particulars. Project programme and timeframes		
2. Estimator's Contract Review	Contract Review. Additional discussion of full contract review (if applicable)		
3. Site Visit Report	Site Visit Details		
4. RFI's & Addenda	RFI's & Addenda received at tender time, and its effect on tender pricing and methodology		
5. Trade Pricing	Trade pricing and coverage, key trades, risk trades		
	Project Preliminary/Overhead allowances		
6. Submissions	Tender clarifications / qualifications as included in covering letter to tender submission		
7. Post-Tender	Post-tender Negotiations, including project details, contractual changes, pricing and documentation changes		
Additional Items:			
Meeting Minutes			
DATE:			
TIME:			
LOCATION:			
ATTENDEES:	**NAME & TITLE**	**SIGNATURE**	**INITIALS**
Meeting Chair:			
Scribe:			
Attendee 1			
Attendee 2			
Attendee 3			
Attendee 4			
Attendee 5			
Attendee 6			
APOLOGIES:	**NAME & TITLE**	**INITIALS**	
Apology 1			
Apology 2			
Apology 3			
Apology 4			
Apology 5			
AGENDA ITEM	**DISCUSSION**	**ACTION ITEMS**	**BY: (INITIALS)**
1. Project Start-up			
2. Contract Review			
3. Site			

4. RFI's & Addenda			
5. Trades			
6. Submission			
7. Post-Tender negotiations			
Additional Items:			

Appendix M – ESP01 Tendering Procedure

TENDERING PROCEDURE

1. PURPOSE

The purpose of this procedure is to ensure that tendering and estimating processes are conducted in accordance with state and federal ethics in tendering guidelines.

2. SCOPE / EXCLUSIONS

The procedure covers all areas of operation of the Group.

3. INTERNAL RFERENCE DOCUMENTS

- ES00 Construction Tender Approval
- ES01 Tender Knowledge Register
- ES02 Subcontractor Summary
- ES03 Document Matrix
- FKG Contract Conditions Review
- FKG Tender Register

4. EXTERNAL REFERENCE DOCUMENTS

N/A

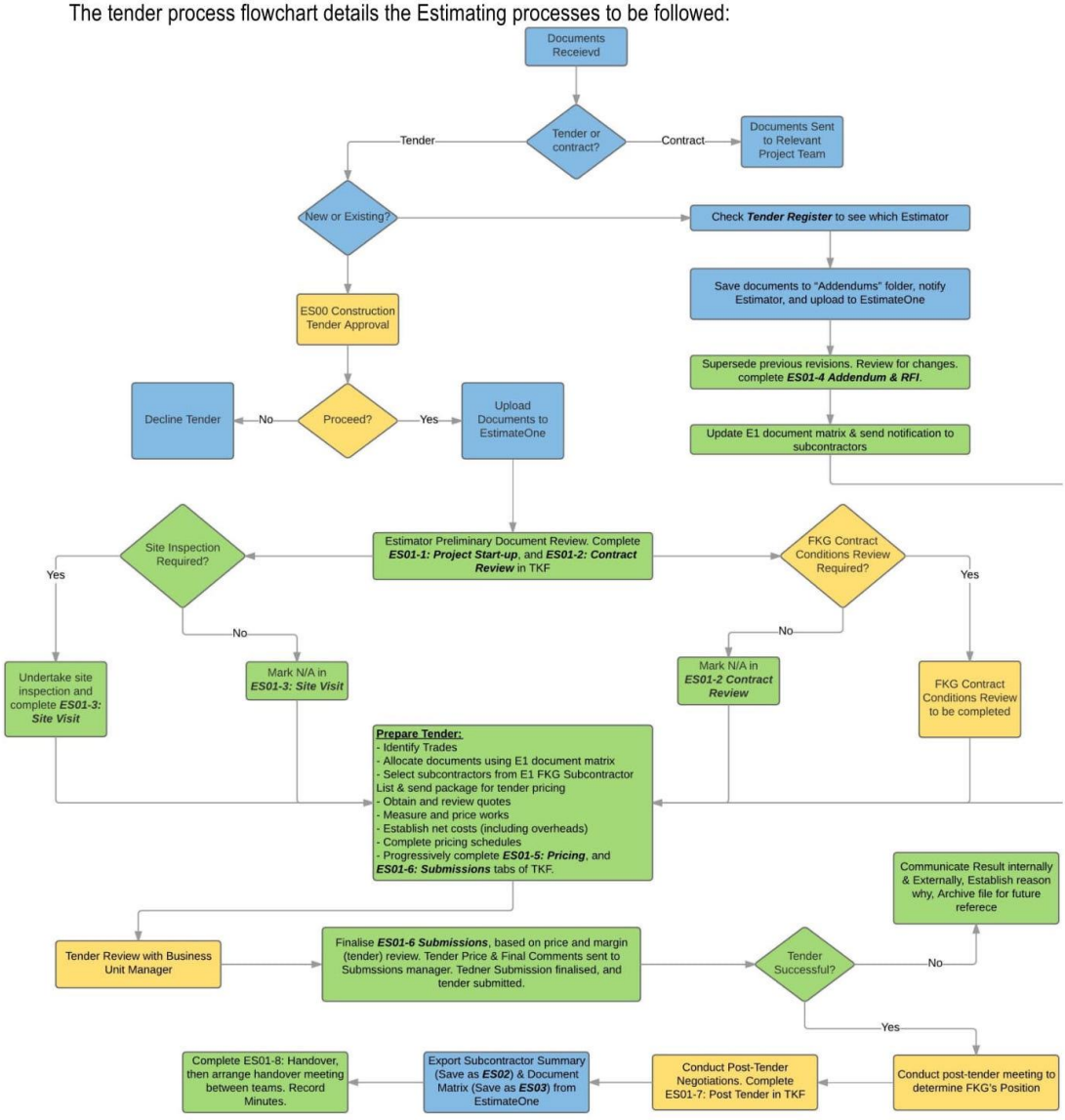
5. DEFINITIONS

N/A

6. TENDERS AND ESTIMATING

6.1. Tender Process Flowchart

The tender process flowchart details the Estimating processes to be followed:



Green Processes & Decisions: Estimator
Blue Processes & Decisions: Estimating Assistant
Yellow Processes & Decisions: Business Unit Managers, Business Development Managers, Contracts Managers etc.

6.2. Estimator's Role

In every expression of interest or tender received, the estimator shall determine client's requirements including:

- requirements specified by the client including availability, delivery and support
- requirements not specified by the client but nonetheless necessary for intended or specified use
- FKG's obligations including regulatory and legal requirements
- ensure that FKG can offer the services required and has the ability to meet the client's requirements. If not, this is to be conveyed/ communicated to the client
- define/outline to the client the services offered/available and recommended

- confirm the client's agreement to and acceptance of the services offered before undertaking/commencing the tender (i.e., in the absence of a written statement of requirement from the client)
- resolve any differences with the client when what is now offered differs from that previously offered or recommended
- record the results of the review including any follow-up requirements or subsequent actions and any changes to requirements (**Refer ES01-7**).
- ensure that relevant personnel are aware of any changed requirements (Refer ES01-8).

The review of identified client requirements together with additional requirements and limitations determined by FKG shall be performed before any commitment is made to supply a particular FKG service or client's document/s to the client

The estimator shall also be responsible for identifying and implementing arrangements for communication with clients with respect to:

- The FK Gardner & Sons Group
- services offered
- feedback and complaints
- take account of legislative and regulatory requirements and unstated or implied client expectations when communicating with clients
- focus on clients' needs and ensure there is pro-active communication with clients with a view to correcting deficiencies and obtaining information on areas for potential improvement.

6.3. Receipt and Review of Tender Documents

Requests to tender to determine whether the Company wishes to submit a tender shall be reviewed by one or a number of the following staff:

- Managing Director
- Business Development Manager
- Business Unit Manager
- Construction Manager and
- Senior Estimator.

Should the FKG Group wish to persue a request to tender opportunity, this decision shall authorised by the relevant managers in line with the limits of authority using the **ES00 Tender Approval**. Refer 6.1 Tendering Process Flowchart.

6.4. Client Communication

At the initial meeting with the client or on receipt of the client's instructions or invitation to quote, the Assigned Estimator is to:

- record the client's and client's agent's details and point of contact, assess nature, range and scope of the client's requirements/instructions (**Refer ES01-1 and ES01-3**)
- take more detailed instructions sufficient to be able to determine:
    - what processes need to be undertaken to satisfy clients requirements
    - what further information and documentation will be required
    - what the fee structure should be
    - applicable time limits
- **ES01-2 and FKG Contractual Review** shall be utilised to review the legal requirements and commercial terms of a tender.

6.5. Preparation of a Tender

In preparing and reviewing the tender/contract agreement, the Assigned Estimator is to:

- resolve any differences between the client's/client's agent's original instructions/tender and subsequent instructions/contract
- resolve any incomplete, ambiguous or conflicting issues through the issuing of requests for information (**ES01-4**)
- by reference to the tender/contract agreement, resolve in detail the scope of the project, the services and the terms and conditions of engagement

6.6. Resolution of Tender Discrepancy

Should any variance or discrepancy be discovered between any of the tender document/s, it is immediately drawn to the attention of the client's representative, documented and resolved.

Any variations to tender conditions or client's requirements are to be documented and such documentation is to be maintained as quality records.

7. CONTRACT REVIEW

7.1. Review of terms and Conditions of Contract

Upon receipt of a contract, this shall be reviewed by the Estimator using **ES01-2**, with further review by Legal Counsel (if required), using **FKG Contract Conditions Review**.

Where issues are identified, these shall be resolved by the Business Unit Manager (or their authorized delegate) prior to the acceptance of terms and the commencement of works.

Evidence of the completion of this review shall be provided to the Project Manager for discussion during the **PM13 Project Commencement Meeting**.

8. TENDER FILE:

8.1. Folder Structure

Upon receipt of tender documents, they are to be filed in tender folder under the following sub-folders:

FOLDER NAME	FOLDER CONTENTS
01. Correspondence	Electronic copies of key emails pertaining to tender (between FKG and superintendent and/or client and/or consultants).
02. Download	Copy of all tender documentation in exact format as received.
03. Drawings & Specifications	Copy of tender documentation, sorted into relevant folders for estimator to access in order to price scope of work
04. Addendums	Copy of each addendum received. Link to ES01 - tender knowledge register (Section 4 being Addendum Register)
05. EstimateOne File	Copy of all documentation which is to be uploaded/has been uploaded to EstimateOne
06. Subcontractors	Correspondence and Subcontractor Quotes Subfolders. Copy of Subcontractor Summary (to be saved post-tender)
07. RFI's	Copy of each RFI submitted. Link to ES01 - tender knowledge register (Section 4 being RFI Register)
09. Site Inspection	Site Photos Subfolder. Link to ES01 - tender knowledge register (Section 3 being Site Visit Report)
10. BOQ & Summary	PDF Copies of tender bill of quantities and summary to be saved post-tender
11. Submission	PDF copy of tender submission, and associated documentation (e.g. Covering Letter)
12. Programme	Copy of tender program and associated correspondence
13. Post-Tender	Summary of post-tender correspondence, any new documentation received, copies of revised pricing schedules etc.
15. Handover	Estimator to collate copies of all information required for tender handover as detailed in ES00-8
16. Design	Design Documentation and correspondence (D&C Tenders Only).

8.2. Internal Reference Documents

The following internal reference documents relate directly to tender pricing:

DOCUMENT TITLE		PURPOSE (INFORMATION RECORDED)	COMPLETED BY
ES00 – Tender Approval		Tender Approval, Resource Allocation, Submission Approval	Business Development Manager
ES01 – Tender Knowledge Register	1. Project Start-up	Tender/Project/Submission Particulars including project programme and timeframes	Estimator
	2. Estimator's Contract Review	Contract Review.	Estimator
	3. Site Visit Report	Site Visit Details	Estimator
	4. RFI's & Addenda	RFI's & Addenda received at tender time, and its effect on tender pricing and methodology	Estimator (RFI's) & Estimating Assistant (Addenda)
	5. Trade Pricing	Trade pricing and coverage, key trades, risk trades, project Preliminary/Overhead allowances	Estimator
	6. Submissions	Tender clarifications / qualifications as included in covering letter to tender submission	Estimator
	7. Post-Tender	Post-tender Negotiations, including project details, contractual changes, pricing and documentation changes	Estimator
	8. Handover	Handover guidelines & handover meeting minutes	Estimator / Estimating Assistant
ES02 – Subcontractor Summary		Export from EstimateOne of Subcontractors invited to price tender	Estimating Assistant
ES03 – Document Matrix		Export from EstimateOne of Tender Documentation and relevant trades who received information.	Estimating Assistant
FKG Contract Conditions Review		Detailed review of conditions highlighted in ES01-2	Legal Counsel / Contracts Manager

9. REPORTING

9.1. Tender Register:

FKG Tender register is to be maintained by Estimating Assistant. Information included in tender register includes:

- Tender name
- Estimator
- Document download information
- Due dates
- Submissions Manager